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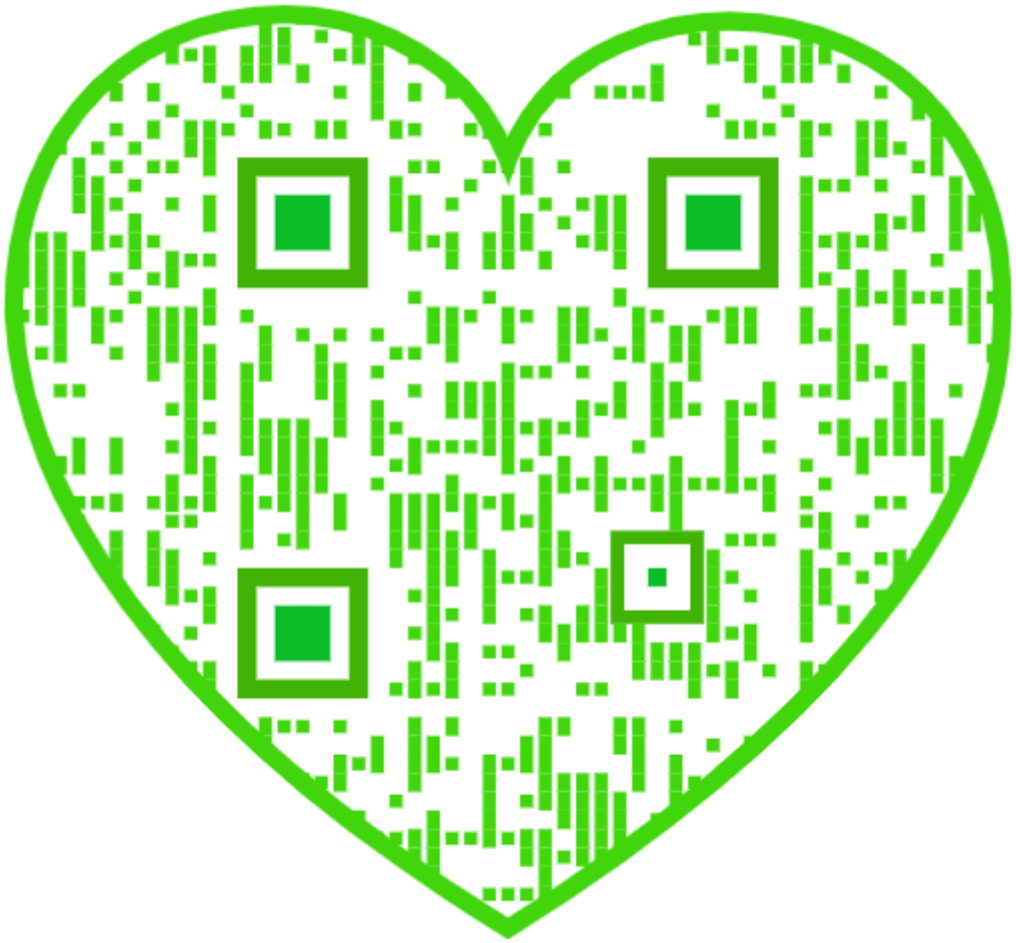

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By JAMES A GREER

CHARLOTTE, N. C.

1915

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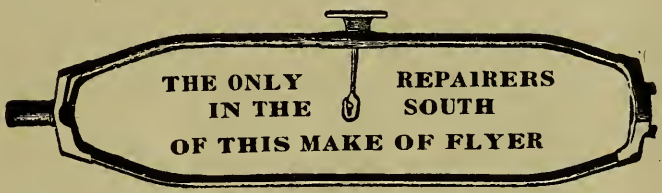

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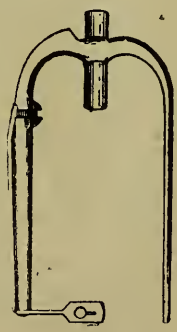

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Greer's Spinning Rules

A Practical Book for Practical People

A book of useful information written for those who wish to know more about Cotton Spinning

By
JAMES A. GREER
Editor Textile Manufacturer

Author
Greer's Practical Carder

JAMES A. GREER
Author and Publisher
Charlotte, N. C.

[1915]

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PREFACE

To write a book on cotton spinning, that would be both interesting and instructive, to those wishing to learn more about this important subject, has been the desire of the Author in preparing the little volume that you now hold in your hand. The plan of dividing the matter into letters was adopted, in order that it would appear, as the sincere advice of the Author, and at the same time, give an excuse for the relating of personal experiences. It has been the object of the Author to refrain from any "high-brow stuff," and to get right down to the plain everyday vernacular of the common mill man. The matter contained herein was published, serially, in the Textile Manufacturer, of Charlotte, N. C., during 1914

The Author has reason to feel proud of the record, his previous publication,---Greers Practical Carder--- has attained and should the present volume become so well known, to the four corners of the textile world, he will feel amply repaid for the time, trouble and expense, incident to the publishing of such a book.

Your particular attention is directed to the advertisements appearing in this book. These advertisers are among the leaders in their respective lines, and it is by their co-operation that a wide distribution of this book has been made possible. That the present volume will be of interest and value, to all into whose hands it may come, is the sincere wish of---

The Author

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LETTER NO. 1.

MY Dear Son: You are doubtless aware of the fact that unless you settle down to business and concentrate your mind and effort on the one thing you wish to accomplish, you will never be worth a pinch of snuff. No one has ever made a success of anything, so long as they have jumped about, like a frog, going nowhere in particular, but just hopping around from one place to another. The thing to do my boy, is to concentrate upon one thing. Act the part of the postage stamp, stick to one thing until you get there. Now you tell me you are going to learn the cotton mill business, good! I am so glad you have decided to take up this work. As you know I have spent the better part of my life in the mill and have acquired some reputation as a mill man, and while I can be of some help to you, by way of telling you, my experience and pointing out to you the many difficulties to be overcome, and the best way to overcome them, you must realize to begin with that the road of a successful mill man is not strewn with roses. There is a great deal of satisfaction in being the possessor of a fund of knowledge in any line of industry. and to acquire this knowledge one must be willing to undergo a great deal of inconvenience, hard work and suffering. Nothing my boy can be accomplished without hard work. Take any accomplishment in life, no matter what it may be, and back of it you will find hard work. You can't get something for nothing, put that down in your memory to begin with. You must work and work hard, but with the advice and help that I can give you, you should be able to get on much faster than I did, for you have many advantages that I did not have. Though by hard work and much inconvenience and self-denial I have been able to get along fairly well, and have enjoyed some of the sunshine of life

with a few of its roses, but son, even the roses have thorns and unless they are handled with caution and judgment they become painful possessions, in spite of all their beauty and fragrance. These words of mine are written hurriedly; as you know I am kept very busy, and have not the time to be as concise as I would like to be, but if you will follow my letters closely and bear in mind that what I tell you is what I have learned in that greatest of all schools—experience—you will be profited by them. Son, I am delighted to hear that you are going to start in the spinning room and believe me, you have got some fun coming to you as you climb the hill of learning to be a boss spinner. There is more action in a spinning room than there is in a good dog fight, and more fun than there is in a barrel of monkeys.

When I began to learn the mill business it was quite different to what it is now, and there was none of the pleasantries that you find in mill life nearly everywhere you go to-day. There has been a great improvement in machinery in general, as well as in the construction of the buildings of the mills. To-day the buildings are all well lighted and almost perfectly ventilated, and the floors are of hard, smooth maple, and too, the floors are regularly scrubbed and are kept sweet and clean. In the scrubbing of the floors they use a disinfecting compound which kills all germs and is a protection to the health of the operatives.

When I first began work in the mills they did not have the well lighted and ventilated buildings that they have now, and the floor, oh, my! Scour them! If any one had suggested such a thing they would probably have been taken for crazy and hurried off to an asylum. The floors were of common yellow pine and soon became soaked with oil, tobacco and snuff spit, and were as slick as glass.

I remember how, during the winter, when I wore shoes, we boys used to skate on the floor and we became so expert in skating that I could easily skate the whole length of a spinning frame. Also I carry a perpetual remembrance of these skating days, in the shape of several

scars on my head caused by falling against a piece of machinery or colliding with some other boy.

Wait a minute son, until I fill up my Jimmy Pipe, I can write so much better of these good old times, when I am enveloped with a cool fragrant smoke. You remember how we used to rehearse some of Sherlock Holmes great tales? Well, it always appeared to me that I could get closer to Holmes and his narrative if I followed his example and smoked a great deal.

Now the old pipe is going beautifully. Son! I hope that you will take my advice and avoid the narrows which I shall try to point out to you while you are learning to be a boss spinner. You have many advantages that never came to me. Andrew Carnegie says that "poverty is a blessing" and whether we agree with him or not, it does seem that most of the great successes of life come to those who have been reared in poverty. In this respect your father enjoyed all the blessings of poverty (?) and has not yet been able to get completely out of that environment, but you, my son are living in a time when all cotton mill people are surrounded with advantages far removed from what they have ever been before. When I was a boy of your age,—and by the way I see from the family Bible that you have just passed your eighteenth birth day—I had already spent about ten years in the mill and was a cracker-jack spinner, doffer, bander and section hand or fixer. My father, who of course is your grandfather, gave me all the advantages that I would accept, but the trouble with me was that I would not or did not appreciate the good advice that he gave me. Probably I would have been better off if I had listened more to my father's advice, and I mention this so that you may take warning if you will, and listen to what I am telling you. I sowed my wild oats and so, proverbially, have had to reap what I sowed .

The sins of the father are said to descend to the third and fourth generation. My son, listen, you are of the third generation of the cotton mill descendants, being the grandson of one of the pioneer cotton mill men of this country. But whether or not you inherit the good or bad

qualities of your ancestors you have certainly shown some of their traits by making up your mind to go into the mill business and learn it thoroughly. That word thoroughly my boy is a good word, place it upon your forehead, write it upon the walls of your room, where you can see it constantly, burn it into your brain, as one of the greatest passports to success that anyone ever had.

Abraham Lincoln, I think it was, used to say, that whatever is worth doing at all is worth doing well. Just another way of saying whatever you do, do it thoroughly. If you are tying on bands, tie them on right, take pains to learn the right method and any good boss spinner can show you the right way to tie on a band, then when you know how to do it, do it right. It pays to do a thing right. When you tie a band on right it will stay on, and do good work longer than two bands will if tied on carelessly. But here, I have taken up all the space allotted to this letter so I will leave you for the present. I will write you again next week and hope to have the time to write you a letter regularly each week. Read this over several times and carefully note those things that may be of service to you in the future.

Until next week, my boy, I bid you adieu.

Sincerely,

DAD.

LETTER NO. 2.

MY Dear Son: We were talking about tying on bands in my last letter, and I wish to impress upon you the importance of bands and banding. This is one of the most important things about a spinning frame, and you cannot afford to be careless about your spinning bands.

They should be made of hard twisted roving and should be uniform in size.

About one-eighth of an inch in diameter will be found a very good size.

They should be tied on uniformly tight, but not too tight, as they will consume a great deal of unnecessary power if tied on too tight.

You will find that, bands made from roving will not stretch, as much, as will bands made from yarn, and so by using the roving band you will not be troubled so much with slack twisted yarn caused from loose bands, but even with roving bands you should have your bander or some reliable person to examine all your bands, at regular intervals, and to cut off all that are found to be slack.

By doing this you will prevent the making of a great deal of soft twisted yarn, which is a dead loss to the company. Sometimes you will find bands that will accumulate lint until they become much larger than their regular size, these should be cut off also, as a large band will not put in the same amount of twist as a small band. The reason for this is obvious. The small band will go deeper into the groove of the spindle whirl, and will drive the spindle faster than the large band which stands up on the larger circumference of the whirl. When you have large and small bands mixed together, it will result in the yarn being unevenly twisted, the same as if you had different sizes of whirls.

I have seen a great deal of trouble come from bad bands, and I learned a long time ago to look closely after my banding. We frequently hear people say that if you will look after the little things, the big things will take care of themselves. This is very true, my boy, and the reason for this is simple.

A band is a small thing, the shafting and hangers overhead are much larger things, but they all require attention, however, your bands may be doing a great deal of bad work and not be very noticeable. They may run along very smoothly and not attract any particular attention but still be making a great deal of bad yarn or causing the spinner a good deal of unnecessary work. It is different with the shafting, as the big thing, when a hanger is neglected, it runs dry, gets hot and begins to smoke, thus taking care of itself or rather showing up its neglect.

One great trouble that frequently results from bad banding is the fact that sometimes you will find that just a few bad bands will keep a spinner "stuck-up" as they say in the mill. If there are, even a dozen, bad bands scattered about on eight or ten sides it will be sufficient to keep the spinner on those sides busy, and when a spinner is kept busy all the time putting up ends there is no opportunity for cleaning the rolls, clearers, rails, etc., and as a result of this there will be a general dissatisfaction on the part of the help, besides a lot of bad work and waste.

One of the most important things for you to fix in your mind, at the very beginning, is the fact, that an end never breaks without a cause, and that wherever an end breaks and is put up there is a bad place in the yarn. The mended place may be as strong as any other part of the yarn but it will not be as smooth or even. So having learned that an end never breaks without a cause, and that each break means waste and bad yarn, we reach the obvious conclusion that when we learn the various causes of breakage, and remove them we are certain to get good yarn with a minimum of waste.

There are many causes for the ends coming down on

a spinning frame, and one of the greatest of these is to be found in the bands. Even when the bands are properly made, they may be tied on too tight or too slack or the knot may be of such a nature as to make the spindle run with a jerk. The ideal condition, to be sought after is a band that will not stretch after it is put on, and to have it put on at the right tension, and tied so as to run with a steady pull the same as if it was endless.

When tying on bands, too many should not be tied on one side of the frame at the same time, as this is likely to pull the cylinder out of line. It is best, in fact it is really necessary, when tying on bands, where they are all off, or even a good many off, to use two banders, one on each side of the frame, each tying on an equal number.

These things, my boy, may appear simple, and they are to many, but you should fix these elementary points firmly in your mind. I have seen many boss spinners, neglect this very thing and I know of some who have fell down on their jobs simply on account of not knowing or neglecting the importance of banding.

A simple way to determine the variation of the twist in yarn caused by different size bands, or to find the true ratio of the spindle to the whirl, would be as follows: Make a circular card just a little larger than the spinning ring, and have a hole in centre of card so that it can be placed on top of the ring with the spindle running through the centre. Make a circle on this card about as large as the ring and divide this circle into one hundred equal parts Then place upon the spindle a hand or pointer similar to the hand of a clock, and in such position that it will move around the circle of the card. Then by turning the cylinder exactly one revolution you can count the revolutions of the spindle to one of the cylinder, and the pointer will show the hundredth part of a revolution of the spindle.

By trying this simple device on various spindles, with different sized bands, much valuable information may be had.

Some years ago I went into a spinning room where they were trying to start up a lot of new spinning, and as

is usually the case everybody was in a great hurry.

The company, anxious to get started, had taken several large orders for hosiery yarn, to be delivered at a certain time, and that time was about to arrive with no yarn in sight.

There had been various and sundry delays such as is always the case in building, equipping, and starting a new mill.

The superintendent being a close personal friend of mine, asked me to look over the spinning and tell him why it would not run.

He also intimated that he was about to quit the job, but he did not want to fall down and was willing to take advice, and would try anything to make that blamed old spinning go. He said many things about his superiors and inferiors that will not bear printing, but that everybody and everything was in a hellofafix there was no denying.

The boss spinner was running around like a chicken with its head cut off, not knowing or caring which way he went, just so he kept busy.

Son, after your father too a look over the room, he could not but feel proud of the fact that he had started in the mill business at the spinning room and had learned to make bands and also to tie them on.

For awhile I let a selfish motive creep into my mind, and I felt that it could do me no possible good to advise these people where their trouble was.

I spent some time looking into the various things that will cause an end to come down on a spinning frame, and I had in mind just what I have told you, that an end never breaks without a cause. To locate the cause is generally, but not always the most important thing to do. Sometimes the cause is easier to locate than to remove.

In the hustle and bustle of starting this new mill they had been in too much of a hurry to look carefully after the little things, these had been neglected and the greatest trouble with the job I have just mentioned was found to be in the banding. They had sent around to various mills in the vicinity and had purchased a great variety of bands, also they had a little boy making bands on

an old time band machine just like your dad ran many years ago.

The bands which were secured from the various mills were of all sizes, lengths and colors, and were made from different kinds of material. They formed a general lot that might be classed as good, bad and indifferent but mostly bad and unfit for use.

Some of them, I noticed particularly were twister bands, larger than a good big lead pencil, and never intended to be used on spinning frames. Then there were others made from a general mixture of roving, slasher waste, and soft filling, and coming from a mill that made colored goods they were of more different colors than Joseph's famous coat ever dared to be. Then the boy that was making bands on the old machine, in an isolated part of the building, he knew no more than a pig, what constituted a good band, and what's more he did not care a tinkers dam, whether they were good, bad or indifferent. Some were as large as your finger others about the size of wrapping twine.

The whole trouble was simply this; the boss spinner and the superintendent had been too busy looking after the big things, and the little things were just about to put them both out of a job. They both knew these things but had simply lost sight of them in the rush of getting started up.

When I explained the trouble and showed them the bands and some other things, the superintendent telephoned a large mill in a neighboring town and arranged to get a large shipment of roving-made bands, of the proper size. When they arrived, by express, the next day, a dozen or more boys and men were put to work cutting off the old bands and tying on the new ones.

I called at the mill a week or so later at the request of the superintendent, who by the way met me at the depot with his new automobile a boad smile and a hearty welcome to visit his mill and his home, where upon his insistence I spent several days with his attractive family, in one of the most beautifully located and handsomely furnished homes I have ever had the pleasure of entering.

At the mill there had come the calm that follows the storm, the sunshine that follows the rain. The trouble had passed over, as a dark cloud, that had threatened to burst upon these men charged with making this spinning run.

Everybody at the mill greeted me with cordiaity and I feared that the superintendent and the boss spinner would become jealous of me on account of the attention that was shown me, but I do not believe that I have two better friends to-day than these two men, though I doubt if the officials higher up were ever told of the matter, and I am sure I never mentiond it to them, though I had ample opportunity to do so. And it all came about from a little close observance of bands and banding on my part and a neglect of these things, on their part.

My son, I want to impress one thing upon your mind in this connection, don't ever try to run over the head of your boss, I mean by that to never go to an official higher up, than the one you are working for. Stick to the man you work for and let his interest be yours. I have always found this to be a good policy and have stuck to it, though there have been many times when I feel that I was doing things for men that would not appreciate them, and that I might gain the good will or possibly a better job by going to some one higher up. I have never done this and I advise you to not do it. Next week I will take up with you some troubles I have had with oiling and in the meantime, let me hear from you, I am always glad to hear how you are getting along with your work.

Sincerely yours,

DAD.

LETTER NO. 3.

MY Dear Son:—I am glad to hear you are getting along so nicely, and that you are now head-doffer. If you will keep right after your work and study the lessons I am sending you, there is no reason why you should not be promoted soon.

In making you head-doffer, the boss is giving you an opportunity to show what you can do, and I want to impress upon you the necessity of keeping your head level. Don't get the big head, now, over your first promotion, you are too well raised for that, just go right along and try to get the other boys to do their work right, but don't try to show your authority, too much. There is a great deal of tact required in handling help, and this is especially true of the spinning room.

You must learn to be firm, but, be kind to every one. You can do a great deal more with people when they respect you than you can if they feel spiteful or revengeful towards you. You must learn to be a leader, not a driver.

When I was a young fellow like you and learning the mill business, the boss was a terror, why we were as afraid of the boss as an innocent child is of the devil. The boss used to take kids down and whip them just like they belonged to them. I have seen the boss take a boy your size, put his head between his knees, and using a top clearer for a paddle, he would proceed to beat the boys' circumstances. I have during my experience as an overseer of spinning been so provoked at times, that I could hardly keep from slapping the wax out of some little insolent brat, and a few times I have put my hands on them pants just like a washerwoman beats clothes with the old soap-stick. Things are quite different now, corporal punishment in the mill would not be tolerated under any

and threatened to throw them out of a four-story window. And also I have frequently had to interview some of these little devils' parents, about the discipline I would enforce upon their unruly progeny.

On a few occasions I have had some old hag approach me, with a big stick and under very provoking circumstances, about her "dear little Johnnie, who had been mistreated by the boss." Nearly every boss spinner could tell an interesting story, from his experience that would bear me out in saying that the way of a boss spinner is equally as hard as that of the transgressor, and there comes to every boss spinner a time when he has to "grin and bear it" to keep from slapping some kid's face key-western-crooked.

All of this, however, you will learn as you advance, and you must, of all things, learn to control your temper and overook the many failings of the help. You cannot expect them to do everything just as you would do it and you must remember that you can't put a grown person's head on a child's shoulders. Just do your best to train the help and teach them to do everything as near right as possible and you will find that if you get the respect and good will of the help you can lead them to do right.

Well, son, I promised to tell you something about oiling this week. You will find this to be more important than most people think. I could call the names of several overseers that I personally know have lost good jobs by neglecting the proper oiling of their machinery. And, too, I can't understand why some mill managers and mill owners are so ignorant or careless of this subject. They will pay high prices for good machinery, employ the best superintendent and overseers to manage their mills and then insist on having some blamed fool that hasen't sense enough to pour sand out of a boot, to oil the machinery. You will find in the mill where you are to-day, that it is the accepted rule that anybody can do the oiling. Yes and anybody can strike a match and stick fire to a ten dollar bill. Simply because of the fact that anybody can pour oil out of a can, is no reason why so important a job as oiling of the machinery in a cotton mill, should be so sadly neglected. If you will just walk around about the

machine shop and take a look at the scrap pile, you will find why I lay such emphasis upon the question of oiling, but the half is not told when you see the scrap pile, with its many broken and worn out parts, a veritable monument to careless oiling.

Oil is cheaper than machinery and the way it is used in the average spinning room shows that it is considered cheap, alright, for I have yet to see the first mill where less oil is put upon the floor, than upon the machinery. I believe it would be safe to say that about three-fourths of the oil delivered to a cotton mill is absolutely wasted. I don't think that statement is strong enough I am going to amend it by striking out the words "three-fourths" and inserting the words "ninety per cent." There is no doubt in my mind but that fully 90 per cent of the oil is wasted. You can find a thousand places about cotton mill machinery where one small drop of oil would be ample lubricant for a period, and if you will take the time to see how these places are oiled you will find the average oiler putting, say a teaspoonful where there should be one drop. "Willful waste makes woeful want," my son, and I want you to learn these things for your own good and for the good of your employer.

Cotton mills are built to make money, but it is a wonder that more of them don't break or go into bankruptcy, in view of the great wastes that are allowed around them.

Take the oiling of spindles on a spinning frame for an example of wastefulness. It is customary to oil spindles every two to four weeks, according to the different ideas of the superintendent or overseer in charge.

High speed spindles require to be oiled with a very light oil, and this should be of good quality, cheap oils are worthless and are to be avoided. The average oiler on spinning puts more oil upon the floor and upon the rails than ever gets into the base of the spindle. If he uses a drip cup he generally files off the spout so that a large stream will pour from the cup, and when he starts at one end of the frame he pours a constant stream from the cup, jumping from one spindle to another, until he reaches the end or his cup runs empty.

Several automatic systems of oiling the spindles have been tried, but as yet none have come into general use. I have seen one patented system that I believe will be eventually adopted with some minor improvement. It consists of an oil reservoir placed upon the head of the frame and at such a level that the oil flows, by gravity, through small pipes to the bases of the spindles. The height of the oil in the spindle base is shown through a glass in the oil reservoir, and the overseer or any one else can tell at any time, just how much oil is in the spindles.

Some fool-proof oiling device for the spinning frame spindles, if perfected and made entirely practical and positive in its action, should make its inventor immensely rich.

I have frequently detected oilers skipping spindles, that is, sometimes when in a hurry to get through, they will oil two spindles and skip two or three, or perhaps sometimes they will skip a whole side if they are not watched carefully. Of course such careless or willfully negligent person, should not be retained under any circumstances, unless you can persuade or force them to do their work right.

The spindles and rolls are perhaps the most important parts of the spinning frame, so far as the oiling is concerned.

The spindles should be oiled as often as necessary to keep them well oiled, and, it has always been my idea that it was better to oil them too much than too little.

The rolls, if shells, should be oiled with a good non-fluid oil and the shells should be mapped out at regular intervals.

Solid top rolls need more frequent oiling than shells, and only a small drop should be put on and that in the right place.

For the top leather rolls an oil should be used that will not spread onto the leather, as this soon ruins them and will make the work run bad.

I do not consider it necessary to lay down any specific rules as to how often any part of a spinning frame should be oiled, as this varies greatly with different kinds

of machinery and different local conditions, nearly every case will need special attention.

It should suffice to say: that every part requiring oil should be perfectly lubricated and kept clean at all times. All oil holes should be carefully cleaned out at regular intervals and care taken to see that the oil reaches the proper place and as little as possible wasted.

Some spinners do not believe in oiling the lifting rods, while others maintain that they should be oiled with good lard oil which seems to possess the quality of not gumming.

Lifting rods frequently cause a great deal of trouble, by sticking and causing tangled bobbins, resulting in a great deal of waste yarn being made. One of the most common causes of lifting rods sticking is the frame being out of line or not level. As long as a lifting rod is perfectly plumb it will not stick unless the bearing becomes clogged with lint. I remember one mill I went to some time ago where there had been a great deal of trouble with the sticking of the lifting rods. I am sure the trouble was the result of the frames being badly out of line and not level. The floors had settled, as all floors will, and as a result the rods would bind and stick. Instead of leveling up and lining the frames the overseer took out all the lifter-rod bushings and had them filed or reamed out so as to allow the rods more play. The result was that there was about a quarter of an inch play, and the ring rail would wobble about from one side to the other, making it practically impossible to keep the spindle in the exact centre of the ring. This caused the spinning to run very badly, while it only partially overcome the trouble of sticking rods.

Steel roll bearings should be oiled with a grease or non-fluid oil, that will not run out onto the flutes of the rolls, as this causes the yarn to become stained, and will also make the ends come down and lap up around the rolls, causing a great deal of waste and also ruining the rolls.

Perhaps it would be safe to say that as a general rule, wherever two surfaces come into contact there lubrication

is needed, the amount and kind being dependent upon the weight and speed or the friction between the two surfaces.

You will note that there should be very little friction in the lifting rod bushing as the rods are supposed to be perfectly plumb and the bushings are there to act merely as a guide, the entire weight of the rod and the ring rail, which it supports, rests upon the roller carried by the rocker.

My son, when you have learned to properly oil and band a spinning frame you will have learned a lesson that will be worth a great deal to you in years to come, if you continue in the cotton mill and make it your life work.

The oiling and banding, in all its different phases is extremely important and should be in the hands of none but trustworthy employees, and then the overseer will find it to his advantage to keep the closest possible watch on these two essential details.

Sincerely,

DAD.

LETTER NO. 4.

MY Dear Son: While you are head-doffer you will have an opportunity to learn a great deal that will be of use to you later on, so be sure to make note of everything of importance as you go along.

You will perhaps be held responsible for the cleaning that is generally, but not always, done by the doffers. I mean the cleaning of certain parts of the frames, such as the head-ends, rockers and gearing, and you should not slight this as being unimportant, because as a matter of fact, it is really one of the most important parts of running a spinning room.

Besides the cleaning of certain parts of the machinery the doffers are usually required to clean-up all bad bobbins, cut off pieces, change travelers, gather up all bobbins that may be upon the floor, etc., etc., in fact I used to think that the boss lay awake at night studying-up things for the doffers to do. However, these things have become attached to the job, so firmly that, few, if any, ever complain now, at having to do these things.

Doffers, as well as all other persons in a spinning room, should be taught to pick up every bobbin seen upon the floor. There should be no such thing as dropping bobbins upon the floor, and allowing them to remain there to be kicked and rolled around, and perhaps becoming smashed. If they contain yarn this is sure to become soiled if it is not picked up promptly. The old rule of the doff-boys picking up bobbins after they have made a "round" of doffing, should be done away with and it should, as already stated, be the rule for everybody to pick up a bobbin as quick as it is dropped. This will prevent a great deal of yarn from being damaged and also save many bobbins from being smashed, both of which will save money for your company.

Where the doff-boys are required to do certain cleaning, you should see that this is done regularly and done thoroughly.

Don't forget what was said in a former letter about, "what is worth doing at all is worth doing well."

It's a mighty good rule to have a regular time for doing things, and then doing them when this time comes around. It is just like the good housekeeper's rule of having "a place for everything and everything in its place."

One of the greatest influences of life is the forming of habits. We can, by the use of a little good judgment, train ourselves to form good and regular habits, and this is very essential, not only in the mill but in our every act of daily life.

We get in the habit of doing certain things and then follow the habit, utterly unconscious of the fact, so you see we should be very careful about what sort of habits we form.

When it comes to changing travelers, you will find that there is a wide difference of opinion among overseers as to when they should be changed and how.

Some overseers never change travelers at all, unless a change is made from one number of yarn to another or unless they wish to change from one number of traveler to another. They simply put on a traveler and let it run until it wears out and flies off. This will probably do on very fine numbers where the travelers are so delicate that they will fly off when they become worn but on coarse numbers it becomes necessary to break off the travelers, at regular intervals, or as soon as they become worn enough to cause bad running work.

As to how often travelers should be changed, this is a debatable question, but one rule will hold good and that is that they should be changed when they are worn enough to make bad yarn or cause the work to run bad.

Now, son when you and your doff-boys are called upon to help change travelers, you should be very careful to see that everyone of the old ones are broken off. I have frequently seen boys when breaking off travelers skip a

great many of them in order to get through with the job sooner. This is especially true when the frame is divided up into shares, each boy being given so much of a side to break off and put on. I have seen them "race" to see which one would get through with their share first, and some of them would, when no one was looking, break off only every other traveler.

You can imagine what kind of work will result from such doings as this and I merely mention these things that you may learn right at the beginning of your career to look out for the little things.

Another important thing about changing travelers is the method of breaking them off. It used to be the custom, and some practice it yet, to take a roving bobbin and hit the traveler a solid blow with the end of the bobbin. This will break the traveler, all right, but generally results in knocking the ring out of position, and it also damages the ring, and for these reasons should not be used. About the best way to break off travelers is to have a hook made of brass or some soft metal, that will not scratch the ring, and by placing this hook under the bow of the traveler a slight twist will be sufficient to break it off.

Now, another thing you should learn while you are head-doffer, is that in order to get production, every frame must be kept running. Don't let your doffers lag behind until there are several frames stopped, but push them up and don't have but the one frame stopped at a time.

When a frame is stopped to doff, it should be started again as quickly as possible, and the ends broken down while doffing should be pieced up immediately and before the boys leave the frame, that is where the boys do their own piecing. If end-piecers are used they should be ready to piece up the ends when the frame is started. Also you should arrange your doffing so that you can doff every other frame, across the room, so as to not have too many frames doffing at the same time on one spinner, which will result in giving the spinner a great deal of trouble. It is sometimes difficult to properly arrange the dof-

fing, especially, if there are a great many different numbers of yarn being made, as the frames will not fill up regularly. However, the object to be sought for, is to arrange your doffing so that the frames may be kept running, and with as little inconvenience as possible to the spinners. This is co-operation, and that's another good word I want you to learn. Let everybody work together for the best results, at all times, and in all ways possible, and there will not only be a successfully run mill, but each one will find their work more satisfactory.

If the frames are so adjusted that they fill the bobbins properly it will greatly help the proper arranging of the doffing.

The traverses should be set so as to put as much yarn on the bobbins as possible, not to tangle, because the more yarn you can get on a bobbin the less doffing there will be to do, and it also helps the spooling, in case of warp yarn; it helps the weaver on filling yarn, and the winders on yarn that goes to the winders.

I have seen men in charge of spinning rooms who gave little or no attention to these details, with the result that they were always in trouble with some other department of the mill. The boss weaver would be continually complaining of the quills not being properly "filled up," the spooler room boss would send back bobbins that were not "full," and there would be an ill feeling between the heads of the various departments, all of which results in poor service for the company.

The more filling you can get on a quill, the longer it will run in the shuttle on the loom, this helps and consequently pleases the weaver, also it tends to reduce the cost of weaving, as well as to make better cloth.

The same thing applies to the warp yarn on spoolers, the more yarn you can get on a bobbin, the less ends there will be to tie-up, and this not only helps to increase the production on the spooler, but it improves the quality of the work, by there being fewer knots in the yarn

I have seen a great deal of trouble and general confusion among the overseers and help, which came as a result of neglecting these matters, which I am warning you

about so that you may avoid them as much as possible.

Many an overseer, who was otherwise a good man has lost his position by becoming careless of these little things. Any boss spinner can tell you that one of his most perplexing problems is bad doffing and careless end piecing.

Doffers are considered by a great many mill men as a "necessary evil" and there is no denying that a set of badly trained or careless doffers can cause as much trouble and loss to a mill as nearly any other one thing.

A doffing machine has been a near-reality for several years and that it will soon be perfected and come into general use is greatly to be hoped for. The perfecting of such a machine will no doubt mark the greatest advancement in spinning for a hundred years.

Doffers should be trained to break down as few ends as possible, while doffing and in piecing-up there should be no lapping of ends. They should be required to do their own end piecing as this will have a tendency to make them more careful, and with the general carelessness that usually attends the class of boys we have for doffers, we need every restraint thrown about them to get them to do their best work.

A good many mills, now pay their doffers on the piece-rate plan, that is they are paid so much per side for doffing and piecing-up, or for doffing where they have end-piecers. This plan has its advantages and disadvantages. While generally all piece work is commendable in that it furnishes an incentive for more work, there are cases where it is applicable only at a disadvantage.

When doffers are on piece-work there will be an inclination for some to run ahead of others, and have many frames stopped at one time. Also they will if allowed to, doff the frames before they are properly filled, thereby attempting to get more doffs.

All of these things, however, must be looked after, and overcome by the overseer, in fact, if it were not for the thousands of little details, some of which I have enumerated in this letter, there would be little for an overseer to do.

These are things, my boy, that you must learn, and

not forget.

Your letter which has just reached me is very encouraging. I am glad to know you like your work as head-doffer, and I believe you will soon be promoted to a section.

Yes, it does take a great deal of patience to work with a "bunch of kids" as you express it. In fact I have thought, at times, that if old Job had had to run a spinning room with some of the "bunches of kids" that it has been my pleasure? to meet, he would have considered all other afflictions as beds of roses, even the boils would have been as blackheads in comparison.

Sincerely,

DAD.

LETTER NO. 5.

MY Dear Son:—Your letter has just reached me after being delayed for a week or more. I am greatly pleased to know that you are getting along so nicely and that you continue to like the work. I have carefully considered all you have said about the men you are working for and while I agree with you in most of what you say, there are some things in your letter that you should not have said. You will learn as you grow older that it is impossible to have everything to your liking, especially is this true in running a spinning room. We must do our very best to get things done right, but as long as we have to depend on human labor, there will be no perfection. It is human to do wrong and to be careless, and you need not get fretted when you find that people won't do things just like you tell them to do them. They never have done it and I don't believe they ever will. If you could start up a room and have plenty of help to run every job and each one would run their job as it should be done, there would be no need for a boss, the superintendent could hire a hand for each job and tell them how to run it, and then go away and leave it to them, but this is all out of the question, there must be bosses and as long as there are bosses, those under them must learn to obey them, and consider that the bosses have a duty to perform as much so as the common hand. Each one must do their duty, and when this is done everything will run smoothly. It is just like a stone building, each stone supports its part of the structure and the whole taken together forms one complete and harmonious edifice.

My Son you must learn to be content with doing your best, remember, that no one can completely overcome all the fallacies of human nature, but be sure that you do

your very best and when that is done you can have the satisfaction of knowing that even God himself could not do more. When one does their best, that's the limit. What else or what more could they do?

I note from your letter that you are still head-doffer and that you have been helping the section men to do the changing, thats right, take every opportunity to learn all you can and don't be afraid of getting your hands dirty, it has never yet hurt anyone.

I never think of changing gears on a spinning frame, without remembering that nearly thirty years ago I used to hold a lantern for my father to change gears. At that time I worked in a mill where they did not have electric lights and I remember how I used to have to brush off the gas pipes every evening just before lighting-up time. I would take a broom and go up one alley and down another brushing the lint off of the gas jets, and a man would follow me with a torch and light each jet. At stopping time it was the doffer boy's job to put out the lights, each one having so many lights to turn out, and I used to think that the "old man" always gave me the ones fartherest away from the door so that I would have to run over every blamed doff box in the mill in getting out after the last light was put out, but I soon learned how to get by that proposition, I would have nearly all my lights out before the whistle blew, that is when the boss didn't watch me too close.

I remember that sometimes the spinning would get to running bad and we doffers would have to get in and help the spinners to run their work. This seemed all wrong to me at that time, but I learned better when I got older and had more experience, just like you will see things in a different light when you get more experience.

When the spinning got to running bad, it was then, that my father and I used to go back to the mill after supper and change twist gears to "beat the band." I would hold a lantern for him to see how to change them.

The changing of gears in a spinning room is an important matter and should be attended to by one who will be careful. In the changing of the draft gears you should

always see that you do not let the back roll slip backwards, for this will cut the yarn, and often cause a whole side of ends to come down when the frame is started. It is best to turn the cylinder backwards just a little before starting to change the gear, as this will generally bring the gears into proper position for changing. Then, too, you should see that the teeth of the gears mesh properly, not too deep, nor yet too shallow, but they should be set so that they will not quite bottom.

It is very important that all gears should be correctly numbered and they should be kept in a gear cabinet, with a separate stall for each number, and they should be taken up, cleaned, and put away as soon as they are changed. Do not allow them to lay around on the ends of the frames or on top of the creels after they are taken out of use. They will get lost and will also get black oil on the creels which will ruin a lot of roving or anything else that may be put on the creels later. It pays to have a good supply of gears of each number, especially, where you have to do a great deal of changing as is the case in a lot of yarn mills.

I have seen mills where they would not buy, nor have made, the proper number of gears to do the changing, and I have had to use two or three different numbers of gears, in making changes simply because I did not have and could not get the right number. I mean by that, that if I was making number twenties with a thirty draft gear and the yarn should get a little light and I wanted to heavy up one tooth, and put on a thirty-one tooth gear, I would not have enough thirty-ones to change all the frames that were on twenties. Sometimes the superintendent would tell me to put on what thirty-ones I had and finish out with thirty-twos, the latter of course would make the yarn as much too heavy as it was too light before the change. Some mills practice this kind of foolishness, and use whatever they have on hand rather than get what is right, with the result of having a great deal of uneven yarn. Such false economy can be found in a great many places.

I have seen mill men who were too stingy or too care-

less to buy a set of dies with which to number their gears, and when it became necessary to change gears, the section hand or second hand would have to count each gear to see if it had the correct number of teeth, this of course, is a cruel waste of valuable time, besides resulting in an occasional general mix-up of gears.

No up-to-date machine shop will or should send out a change gear without having it properly numbered, and then they should be kept in a suitable place, conveniently provided, and arranged for keeping them separate and clean at all times.

Son, next week I am going to take up a few calculations with you and begin to teach you how to figure out any change that may be necessary. I feel sure that you are learning very fast and I am proud of the fact that you are with good men and a good company. Let me hear from you regularly. Sincerely,

DAD.

LETTER NO. 6.

MY Dear Son:—I am just in receipt of your valued letter telling me you had been promoted to a section, good for you, go to it! I knew you could do it and I was not altogether surprised when I received your letter telling me that you had been promoted.

Now Son, let me tell you something,—but wait a minute, till I get my pipe loaded up—now the old pipe is smoking like a German cannon at the battle of Aisne, and by the way do you smoke? If you do, for Heavens sake cut the cigarette and smoke a good pipe.

Speaking of smoking reminds me that when I was a kid my father used to make me smoke, yes sir, but he didn't furnish any fragrant havanas or even a good old jimmy pipe, nope, he used a leather belt or a top clearer off of a spinning frame, and I'll tell you what's a fact, top clearers would make fine clothes cleaners, I've seen them used in the dry cleaning process and they certainly make the dust fly, but hereafter I want mine removed from my frame before being subjected to this dry cleaning process.

Now, as a section hand you will have greater opportunity, as well as more responsibilities, and you should begin to be more serious about your duties.

You should begin to study human nature as you take up the duties of directing others.

You will find that people vary as much in their dispositions as they do in their features, no two people being exactly alike in every particular, some will require a little humoring, others must be dealt with in a cold austere manner, and still others require to be let severely alone. Some require one kind of treatment, some another, but on the whole you will find it best to be firm, yet kind and considerate of all.

If you will be careful, cautious and considerate, in the management of the help placed under your charge, you will soon have the good will and respect of all with whom you come in contact.

In spite of the most careful attention to your duties, you will, at times find yourself in a predicament with your help. When such times come, you should endeavor to keep your head, and above all be loyal to your employers. Teach your help to be loyal to the interests of the company for which they are working and when things go wrong, when the work runs bad, when help gets short or when business gets dull for the mill, remember that it is then that you should, rise to the occasion and show your worth to your employer.

The poet put it this way:

"It's easy enough to be pleasant,
When life moves along like a song.
But the man worth while,
Is the man who can smile
When everything goes dead-wrong."

Try as hard as we may we cannot avoid difficulties, they will come in every business and in every kind of work under the sun, but every difficulty overcome, every trouble encountered and surmounted only strengthens us and prepares us to overcome still greater difficulties.

The enforcing of discipline in a cotton mill and especially in the spinning room is a serious matter, and calls for men of good judgment. To be equal to any task, to rise to any emergency, you must be ever on the alert, giving your work the most careful attention.

Along with your enlarged duties and opportunities there will come increased temptations. As your wages become greater you will have more money to spend or more to save, just as you choose. Also you are now in posiiton where you will come in direct contact with many girls and women, some oi whom will not bear a reputation equal to that of Ceasar's wife.

Taken as a class and considering the environments of the girls who work in the mlils, it is my opinion that there is considerably mort virtue, and certainly more mod-

esty than you generally find in the higher circles of society. However, you will occasionally meet with those, whose company you must shun, if you would succeed in life. Nothing will more surely ruin a man in business, than undue intimacy with his female employees. Read the fifth and seventh chapters of Proverbs and take warning from the wisest man who ever lived.

I promised to give you some calculations this week and from the way you are progressing I think you will soon have need for them.

One of the first things you should learn is the system used for numbering cotton yarn, as this is largely used in nearly all the calculations that you will find a need for.

One hank of number one yarn weighs one pound. It is upon this basis that the entire system of numbering cotton yarns is established. This system, while simple, is not always easily understood by the student. Let us analyze this system and get it in the simplest form possible, that we may thoroughly understand just what is meant by yarn numbering. A hank of cotton yarn is 840 yards in length. This is the standard length upon which all calculations are based.

The number of hanks, required to weigh one pound (avoirdupois,) is the number of the yarn.

To find the number of cotton yarn:

Rule: Reel off 120 yards and weigh it. Divide the weight, in grains into 1000, the quotient is the number of the yarn.

Example: Suppose 120 yards of yarn is found to weigh 50 grains, then: $1000 \div 50 = 20$, the yarn would be called number 20. The weight of one hank (840 yards) in grains divided into 7000 (the number of grains in one pound) equals, the number.

The reason why it is customary to use 120 yards instead of 840 yards, in the making of yarn calculations is on account of the excessive waste that would result from frequent sizings of 840 yards each, we reduce the length and weight in the same proportion using 120 yards which is 1-7 of a hank and 1000 grains which is 1-7 of a pound. The following tables are used in cotton yarn numbering.

Table of Measurement.

1 1-2 yards = 1 thread or circumference of yarn reel.
120 yards = 80 threads = 1 skein.
840 yards = 560 threads = 7 skeins = 1 hank.

Table of Weights.

27.34 grains = 1 dram.
437.5 grains = 16 drams = 1 ounce.
7000 grains = 256 drams = 16 ounces = 1 pound.

Practical Examples.

To find the number of any amount of yarn when the length and weight are known:

Rule: Divide the total length in yds. by the weight in pounds, and the result obtained by 840, (the standard length of one hank).

Example What would be the number of 168,000 yards of yarn, if it weighed 20 pounds?

Divide the length, 168,000 by 20 pounds = 8400 and this divided by 840 = 10 the number of the yarn.

What would be the number of yarn in a warp 4200 yards in length, if it contained 400 ends and weighed 100 pounds. First find the total length of yarn in the warp by multiplying the length 4,200 by the number of ends 400. $4200 \times 400 = 1{,}680{,}000$ then applying the rule given, $1{,}680{,}000 \div 100 = 16{,}800 \div 840 = 20$ the number of the yarn.

What would be the weight of a warp 4200 yards in length, if it contained 400 ends and was made up of number 20 yarn? As in the preceding example first find the total number of yards in the warp. This is done by multiplying the length by the number of ends, $4200 \times 400 =$ 1,680,000 yards then divide this by the number of the yarn and by 840. $1{,}680{,}000 \div 20 = 84{,}000 \div 840 =$ 100 pounds, the weight of the warp.

To find the length of yarn in a warp:

How many yards of yarn would there be in a warp weighing 100 pounds and made up of number 20 yarn.

Rule: Multiply 840 by the number of yarn and this result by the weight of the warp, thus: $840 \times 20 \times 100 =$ 1,680.000 yards, total length of yarn in the warp.

I have put these calculations in the simplest form I

could think of so that you could get at the very foundation of yarn calculation.

Later on we will take up the questions of draft, twist, production and all the other necessary calculations pertaining to spinning.

Keep pegging away son, and don't be afraid of work. Take right a-hold of anything that it becomes necessary for you to do and constantly keep in mind that nothing can be accomplished without hard work, and while you are working don't forget to learn the value of time, it is the greatest asset of all those who have become famous or even done things worth while. Napoleon was once asked why he so completely overwhelmed every enemy that came before him, to which he replied, "they (his enemies) do not know the value of time."

Read this letter carefully son and then write me what you think about it. Sincerely,

DAD

LETTER NO. 7.

MY Dear Son: Your letter has just come to hand telling me about the labor troubles that had sprang up at the mill where you are.

Now my advice to you is to keep entirely away from this sort of thing, don't take sides with either party in a dispute where no good is to be the result, you have everything to lose and nothing to gain, so be neutral and keep out of any entangling alliance.

I am not opposed to a properly organized and well regulated labor union, I believe that labor has as much right to organize as has capital. The laboring man has rights, there is no denying that and as a general proposition no one does deny it. I believe that some labor unions, such as the well organized trade unions, do a great deal of good and if you will take the trouble to investigate you will find that they are organized for mutual benefit and not to antagonize their employers.

The labor union that makes trouble for everybody is the one that is fostered by a gang of foreigners, who care no more for the rights of labor, than they do for well organized democratic government, and it is their sworn purpose in life to destroy all forms of government.

There is no need for labor unions among the textile operatives of the South. The industry has progressed and prospered here, as no where else on earth, and there has sprang up a feeling of mutual dependence between employer and employee, that it will be difficult to break down, moreover, he who attempts to destroy this mutuality is a traitor!

The best friend the mill operatives of the South have to-day, is the mill owners.

He is their best friend simply because of the fact, that he has, in most cases grown up with them and amid simi-

lar surroundings, furthermore there is, as already stated, a feeling of mutual dependence, which is growing stronger every year. There is absolutely no excuse for anyone to try to stir up a feeling of discontent among the mill operatives where this feeling of mutual dependence prevails.

A strike is an instrument made use of by those who have become temporarily insane

It injures everyone who comes in contact with it and sometimes its harmful effects descend to the third and fourth generation. Expressed in plain blunt words, a strike hurts everybody and helps nobody. This is the literal truth, as shown by the history of strikes for the past hundred years.

I have stated that I am not opposed to a well organized labor union. I mean by that, that I am heartily in favor of giving the mill operative, all the freedom and privilege that any other people have, but I am unalterably opposed to foreigners coming into the South and organizing our people into unions for no other purpose than to plunder and rob them and to set up a doctrine of anarchy that is in the highest degree repugnant to our best interests, and destructive to our civil and religious freedom.

Does any sensible person believe that these foreign interlopers are actuated by a sense of brotherly feeling, when they come from a section that has always been hostile to the Southern people?

Son, be not deceived, by a wolf in sheep's clothing. The underlying motive in this effort to organize labor unions among the Southern mill operatives, by Northern and foreign interests, is a business proposition pure and simple, for the benefit of the organizers at the expense of the organized. Keep away from it as you would a plague.

If the Southern textile workers must have an organization, let them organize one suitable to conditions in this section.

To adapt the tenets of an organization foreign and antagonistic to this section is the height of folly. As well might we substitute a fetishism for Christianity. The true solution of this problem is, I believe, for every manufac-

turer to realize that his employees are entitled to a just wage and to a fair and impartial hearing in the adjustment of any differences that may arise in the relations of employer and employee. On the other hand the employee should fully understand that the employer has many and serious responsibilities, and that in furnishing them with employment at a just wage they are entitled to and should receive honest and loyal service. When an employee renders efficient service, he may go to his employer, with the assurance of getting a faithful hearing on any supposed or actual grievance that he may have. Not to believe this is unreasonable, for how can any intelligent person refuse to consider their own interest?

The employer knows better than anyone else that he cannot operate his mill, successfully, without the best labor obtainable, and it is he who is giving of both time and money to raise the standard of the Southern mill operative.

But here I am giving you a lecture on things you, perhaps, already know, when I had promised to give you some more figures, but after all I want you to learn the human side of the industry as well as the theoretical side. I have known many men to make successful mill managers, who were short on theoretical knowledge, but long on knowledge of human nature. They were good managers; had a tact for getting and keeping good men and letting them attend to the details. One in your position, however, should learn every detail of the business, for nothing stamps a man "master of the situation" so much as to be able to tell those under him exactly how to do a thing and if necessary, to be able to take hold and show them that he not only knows how it should be done, but that he can do it.

Don't let the trouble that has come up at your mill discourage you in the least, it is only one of those things that seem to be incident to business. Sit steady in the boat, don't let misfortune dissuade you from your purpose. "The little mind is tamed and subdued by misfortunes, the great mind rises above them."

The true unionism to be hoped for is a unionism of employer and employee.

Such a union may be slow in coming but it is inevitable, the best interests of both parties demand it, the relation of master and servant is gradually falling into disrepute and in its place there is being set up a mutual relationship of employer and employee.

It has been proven a thousand times that men who work in harmony are twice as valuable as those who are antagonistic to each other. I have taken up all my space for this letter and will have to stop now, but I trust you will find food for thought in what I have said here. The following verse from James Whitcomb Riley comes to mind just at this time and I give it here for your inspiration:

KEEP ON.

If the day looks kinder gloomy,
An' your chances kinder slim,
If the situation's puzzlin'
An' the prospect's awful grim,
An' perplexities keep pressin'
'Til all hope is nearly gone,
Just bristle up and grit your teeth,
An' keep on keepin' on.

Fumin' never wins a fight,
An' frettin' never pays;
There ain't no good of broodin' in
These pessimistic ways—
Smile just kinder cheerfully
When hope is nearly gone,
And bristle up and grit your teeth,
An' keep on keepin' on.

There ain't no use in growlin'
An' grumblin' all the time
When music's ringin' everywhere
An' everything's a rhyme—
Just keep on smilin' cheerfully
If hope is nearly gone,
An' bristle up and grit your teeth,
An' keep on keepin' on.

Just keep on keeping on, you are doing nicely and I am proud of you. Write me regularly and when I can help you it will afford me the greatest pleasure to do so.

Sincerely, DAD.

LETTER NO. 8.

MY Dear Son: Your letter has come to hand and I note what you say about making a change. Under the conditions existing at your mill you will do well to stay there. There is nothing to be gained by a continual moving from one place to another.

Instead of giving you the figures I had prepared for you, I am going to give you a paper that I read before the Southern Textile Association, at Chattanooga, Tenn., in 1912, on the subject of changes.

"Why So Many Changes?"

Mr. President: I wish to speak a few words upon a subject that seems to me to be one of the most important issues before the Southern Textile Industry, to-day. An issue that vitally affects the earning power of every cotton mill in the Southern States; one upon which depends the happiness of thousands of the homes of our mill people; one that is partly responsible for the present high cost of living. The proper settlement of the question to which I refer would add roses to the pathway of the cotton mill superintendent and overseer where now there are only thorns. Mr. President I refer to the question that has been asked a thousand times and answered with as many different answers. Why so many changes? Why are there so many changes among our mill people here in the South? I am told that this condition does not prevail in other lines of work nor does it exist in other sections of the textile industry.

Every member of this association is familiar with the fact that a large number of our mill people are continually moving from one mill to another, and a few years ago when there was a great scarcity of labor and thousands of spindles and looms were idle, it was conservatively esti-

mated that there were enough mill hands on the road moving from one mill to another to run every idle machine in the South. Now as sure as water runs down hill, there is a cause for this condition. What is it? Do they move to better their condition? Do they get an increase of wages every time they move? Do they find a more healthful place to live every time they move? If so some of our operatives would soon be rich and living at health resorts.

Gentlemen, I do not propose to tell you that this condition can be changed by any revolutionary method. I do not wish to be considered a pessimist. I am an optimist by nature. I believe there is more good in the world than there is bad, that there are more sunny days than there are cloudy days and that everything happens for the best, but we all know that clouds and gloom will come at frequent intervals. We cannot have sunshine and flowers all the time. If the individual members of this association will give serious attention to the question I am referring to, much good will result therefrom. The big question before the cotton mill superintendent and overseer to-day is not how to figure draft and twist, nor the proper construction of a piece of cloth. These are matters of secondary importance. A great many of the operatives in our mills can make all the necessary calculations for operating the machinery. Those three excellent textile weeklies published in Charlotte together with that high class textile journal published in Atlanta and the many text books now on the market are educating the mill people of the South in a technical way. Even the unlettered man has ways and means of obtaining results from the machinery.

Take for instance the production of a card. While this may be obtained in several ways by figuring from the gears and speeds a short and simple way to obtain the result is as follows: Stand before a card, with a watch, break down the end and allow the sliver to run upon the floor for one minute. The weight of this sliver in grains multiplied by six and divided by seventy gives the production in pounds for ten hours running time. This rule also applies to any other machine in the card room.

Now I say again these technical matters are of secondary importance. The big job today of running a cotton mill is the handling of the labor problem and it would be well for this association, composed as it is, of the men who are to handle this problem first hand, to discuss ways and means of bringing about more stability among our operatives. Some of the best managed mills are now giving attention to this problem and a great deal is being done to make living conditions for the mill operative more attractive than heretofore. The people themselves, however, are largely responsible for so much changing and they need to be taught by precept and example that often they have good opportunities right where they are and that instead of going away to hunt for bigger possibilities, they should develop their present holdings. No doubt ninety per cent of the changes are made with the intention of doing better but the people are simply mistaken or misled.

It seems to have become a habit with our people to look elsewhere for what they desire. I am reminded here of the story of Al Hafed, an ancient Persian, who owned a large farm with orchards, grain fields and gardens. He had money at interest, had a beautiful wife and lovely children and was a wealthy and contented man; contented because he was wealthy and wealthy because he was contented. One day there visited the old Persian farmer one of those ancient Buddist priests, one of the wise men of the East who sat down by Al Hafed's fireside and told the old farmer how this world was made. He told him that this world was once a great bank of fog and that the Almighty thrust his finger into this bank of fog and began slowly to move his finger around and then increased the speed of his finger until he whirled this bank of fog into a solid ball of fire and as it went rolling through the universe burning its way through other banks of fog it condensed the moisture until it fell in floods of rain upon the heated surface of the world and cooled the outward crust, then the internal fire bursting the cooling crust threw up the mountains and hills and valleys of this wonderful world of ours, and said the old priest, if this internal melted mass burst forth and cooled very quickly it became gran-

ite. If it cooled more slowly it became copper. If it cooled less quickly, silver—less quickly, gold, and after gold diamonds were made. Said the old priest a diamond is a congealed drop of sunlight.

The old priest told Al Hafed if he had a diamond the size of his thumb he could purchase a dozen farms like his and said the priest if you had a handful of diamonds you could purchase a county and if you had a mine of diamonds you could purchase kingdoms and place your children upon thrones through the influence of your great wealth.

Al Hafed heard all about the diamonds that night and went to bed a poor man. He wanted a whole mine of diamonds. Early in the morning he sought the priest and awoke him. Al Hafed said, "Will you tell me where I can find diamonds?" The priest said, "What you you want of diamonds? Said Al Hafed, "I want to be immensely rich." "Well, said the priest, if you want diamonds all you have to do is to go and find them and then you will have them." "But, said Al Hafed, I don't know where to go."

"If you will find a river that runs over white sands, between high mountains, in those white sands you will always find diamonds." "But, asked Al Hafed, do you believe there is such a river?" "Plenty of them; all you have to do is just go where they are. "Well, said Al Hafed, I will go." So he sold his farm, collected his money that was at interest, left his family in charge of a neighbor and away he went in search of diamonds. He began his search at the mountains of the Moon, afterward he came around into Palestine and then wandered on into Europe. At last when his money was all gone and he was in rags, poverty and wretchedness, he stood on the shore at Barcelona in Spain. When a great tidal wave swept upon the shore the poor starving, afflicted stranger could not resist the awful temptation to cast himself into that incoming tide and he sank beneath its foamy crest never to rise in this life again.

Now the man who purchased Al Hafed's farm led his camel out into the garden to drink and as the animal put his nose into the shallow water of the garden brook, Al

Hafed's successor noticed a curious flash of light from the white sands of the stream. Reaching in he pulled out a black stone containing a strange eye of light. He took it into the house as a curious pebble and putting it on the mantel went his way and forgot all about it, but not long after that the same old priest came to visit Al Hafed's successor. The moment he opened the door he noticed the flash of light. He rushed to the mantel and said, "Here is a diamond! here is a diamond! Has Al Hafed returned?" "Oh no, Al Hafed has not returned and we have not heard from him since he went away, and that is not a diamond, it is nothing but a stone we found out in our garden."

"But, said the priest, I know a diamond when I see it, I tell you that is a diamond." Then together they went out into the garden. They stirred up the white sands with their fingers and there came up other, more beautiful, more valuable gems than the first. Thus was discovered the diamond mines of Golconda, the most valuable diamond mines in the history of the ancient world.

Had Al Hafed remained at home and dug in his own cellar or in his own wheat fields instead of wretchedness, starvation, poverty and death in a strange land, he would have had acres of diamonds. Acres of diamonds, Yes, for it is historically true that every acre of that old farm, even every shovelful, afterward revealed the gems which since have decorated the crowns of monarchs.

Very few of us ever dream that we may have acres of diamonds in our present position though we can look back and see the results when it is too late.

Now young men sometimes say: "There is no advancement where I am, my employer is unappreciative, he is unjust." It is true that there are such instances. There are mean men in all lines of business, no doubt, but as a rule the fault lies more often with the employee than with the employer. Very few employers will prevent the cream of their establishment from rising to the top. It wouldn't be good business to do so. If you are certain that you are with the wrong firm or not in the right business then your duty requires you to make a change but be care-

ful that you do not leave acres of diamonds to hunt for the end of the rainbow.

Now, I have not answered the question. Why so many changes? nor could I do so in the short time necessarily given to these discussions here. A great many changes are induced by advertisements for help; some of which are as much exaggerated and as misleading as the ordinary circus poster. Many a happy and contented family have been lured into moving through this means, that probably could not have been moved otherwise and often instead of bettering their condition, instead of finding diamonds they soon wake up to the awful fact that they have made a mistake and they either return to their former home or continue to move from place to place hoping for something better.

Frequently changes are made on account of the lack of managing ability on the part of the superintendent or overseer. It requires considerable tact to manage the ordinary mill operative of the South, and this quality is greatly lacking in many of our men. Sometimes disputes arise among the operatives that can only be adjusted by the mature judgment of the superintendent, or overseer in charge, and if this matter is left with some section man or head doffer—as it sometimes is—it may result in one or two families of competent mill help becoming dissatisfied and moving away. I have seen this happen and so have you and when one party becomes dissatisfied at a place, they can and often do influence others to leave.

The vast majority of people are like sheep they follow a leader, so where you have strong leaders for good the majority will generally follow and vice versa. We must teach our people that it does not pay to be continually changing. We can take for a text the words of Carlysle, "Our grand business undoubtedly, is not to see what lies dimly at a distance, but to do what lies clearly at hand." One other illustration and I am through.

Some years ago there was a contented and well-to-do farmer in Pennsylvania who having heard of the enormous profits to be made in oil decided to sell his farm and embark in the oil business. He wrote to a friend in New

York of what he intended doing. This friend being better posted on such matters advised that he first study the oil business and learn something of it before taking such a radical step. Acting upon this advice the farmer bought up all of the literature available on the subject of oil and began a systematic study. After six months of study and careful research he again wrote his friend saying that now he knew all about oil from the second day of God's Creation down to the present time. So he sold his farm and went to New York to engage in the oil business. A few days later, the man to whom he sold his farm went down to the creek to water his horses. He noticed at the watering place some boards placed at an angle across the stream to throw to one side a heavy scum through which the horses would not drink. An investigation was made and it was learned that this man who knew all there was to be known about oil and who had sold this farm for $800.00 and moved away to enter the oil business had for 23 years been damming up one of the righest streams of coal oil ever found in America and from which subsequent owners have made millions of dollars.

It is often said that the man who never makes a mistake never makes anything and it may be true but it is worth while that we take a retrospective view of our own lives and resolve that if we must make mistakes they shall be as few as possible and that we will not make the same mistake twice. Let us seek always to build up and improve our present opportunities instead of choosing vain and imaginary greatness and let us not forget that:

"Time will bring summer, when briars will have blossoms as well as thorns, and those blossoms will be as sweet as the thorns are sharp."

Son, you will do well to study this phase of your mill work carefully. It is more important than the minor details. Write me often and long letters.

Sincerely, DAD.

LETTER NO. 9.

MY Dear Son:—This will acknowledge your letter telling me that the labor trouble at your mill had vanished and I breathe a silent prayer that it may never return. I know what it means to be mixed up in labor truobles and I trust you will have no further trouble of this kind.

You appear to be doing well on your section, and I suppose you have learned to handle the doffers by now. Yes, I know it is perplexing to handle doffers, but do you know, the training a doffer gets in the mill is worth a great deal to him and it is also a good training for one to have the management of a set of doffers.

Nearly all of our good mill men have been through the exact experience that you are now having and I urge you to be patient, and rest assured that the experience will be worth a good deal to you in years to come.

I am enclosing herewith a story of Andrew Carnegie as a doffer boy and I am sure you will find it interesting. It is a true story, the facts having been furnished by Mr. Carnegie.

Many of the great men in all walks of life and in all times have come up from the ranks of the poor. This statement applies with full force to Andrew Carnegie the subject of this sketch. To one familiar with conditions prevailing among our Southern cotton mills, it is a long step from the doffer-boy of to-day, with his onerous duties, to the position of millionaire, burdened with the task of giving away vast sums of money, yet this is a true story of the road that has been traveled by Andrew Carnegie during the past 66 years. It seems a long time since the year in which Queen Victoria first ascended the throne of England, and in fact it is more than three quarters of a century since that event took place. In the same year, 1837,

in the town of Dunfermline, Scotland, in the home of a family of poor people who depended on their small "home cotton factory" for a living, there Andrew Carnegie was born, on the 25th day of November.

The story connected with the early life of Andrew Carnegie, is one of unusual interest to the entire world and of especial significance to the thousands of small boys and young men who are to-day plodding along lines similar to those followed by Andrew Carnegie during the early part of his career, and it is hoped that a recital here, of some of the difficulties which were met and overcome, will be a source of inspiration to some of our Southern cotton mill boys. The boys of to-day have far better conditions under which to labor and have much greater leisure time to devote to self-improvement. The road from doffer-boy to millionaire must of necessity be a hard and rugged road to travel, and of course, "few there be that find it," but we are not surprised, nowadays, to hear of those who have come up from the ranks of poverty to the eminence of success. History shows that practically all of our great men have come from the ranks of the poor, and the subject of this sketch, whose authority on such matters would seem to be conclusive, has repeatedly said: "It is a great blessing to be born poor." In keeping with this paradox Mr. Carnegie gives us another one in these words, "He who dies rich dies disgraced." Such pithy paradoxes as these are not readily assimilated by the great majority of people, but there is much truth in them as we can see by looking far beneath the surface and into the very inner meaning of them. Andrew Carnegie's father was an expert weaver, and, as was the custom at the time referred to, he owned a small "home cotton factory" consisting of four damask looms, which of course were operated by hand power. The power of steam loom, as it was sometimes called, had not then come into general use, but was gradually being adopted in the leading manufacturing centers, and was also making inroads on the earnings of those who depended on their hand looms for their subsistence. The elder Mr. Carnegie being as I have said, an expert weaver would receive many orders from the

dealers in his immediate vicinity, for towels, table cloths, napkins and other such goods as could be woven on the damask looms.

The dealers would in most cases furnish the yarn or thread to be used in the making of the goods they had ordered, leaving to Mr. Carnegie and his apprentices the weaving of the goods according to specifications. It was amid such surroundings as these that Andrew Carnegie grew up.

The invention and introduction of the power loom, as well as that of the cotton gin, the cylinder card and the spinning mule were rapidly changing the old system of home factories, to that of the public factory system, wherein all the processes of making yarn and cloth were carried on under one roof. This change to the public factory system, with its large production at greatly reduced cost, made possible by the economies of concentrated capital, soon put the home factories at a great disadvantage, as they could not compete with the new factories, equipped, as they were with modern machinery and greater facilities for turning out the various classes of goods required. As a result of the change the home factories was gradually forced out of business, and this disaster soon came to the Carnegie home. Orders began falling off, and though Mr. Carnegie struggled against the adverse condition he, too, was finally forced to close up his shop, as no order could be obtained, at a figure that would allow of any profit. Though Mr. Carnegie had been able for many years to support his family, through the operation of his "factory" he was now face to face with the problem of no work and no income. There was nothing to be gained by moving to another town; the same condition prevailed everywhere. Andy was at this time a lad of ten years, and he had helped his father around the home factory for several years doing such work, as could be done by a boy of his age. That Andy had been schooled in strictest economy is illustrated by an anecdote told of him during his school days. It was the custom at roll call each morning for the pupil to arise when his name was called and repeat a verse from the Bible. Andy on one occasion

stood up and said: "Take care of the pence and the pounds will take care of themselves." The shadow of gloom now cast over the future prospects of the little family, on account of being unable to get more orders, wherewith to operate their looms, resulted in the decision to follow the example of some of their relatives who had a few years before gone across the big pond, and located at Pittsburg in America. The parents came to this conclusion, after a family council, the main consideration being "the future of our two boys, Tom and Andy." This decision was followed by quick action, the looms and the business were sold and preparations made for the trip to America. The breaking up of home and family ties, was not done without many a heartache and regret, but the decision having been reached they lost no time in making final arrangements for the long move. It was in 1848 when the little party consisting of father, mother, Tom and Andy embarked upon the sailing vessel Wiscassett, and began their seven weeks' voyage across the ocean to the land of promise. The crossing of the Atlantic in a sailing vessel, was no pleasant undertaking but the sturdy and determined character of the Carnegies was such that they were not to be easily deterred from their purpose. The party of four, reached Pittsburg safely and at once settled down to business. Andrew's father secured work in a cotton mill, and when Andrew was 12 years of age he began his business career as a doffer-boy at the mill where his father and brother Tom were at work. The hours of labor then were much longer than they are now and everyone was required to work from dark till dark, with 40 minutes for dinner. Andrew's salary at this time was 20 cents a day and each week he received his salary of $1.20 with a feeling of pride. Mr. Carnegie frequently refers to this fact to-day and says it was one of the joys of his life when he reached the point where he could contribute something toward the support of the family.

Andrew Carnegie, as a doffer-boy, doubtless displayed the keen foresight that has since distinguished him as a man of finance. The hard work and long hours of the cot-

ton mills of those days with the attendant small pay that the operatives received, no doubt made life a monotonous burden, but to Andrew Carnegie it was an inspiration, and to have come up through the ranks of the hard laborers of his adopted country is one of the proud boasts of this dour Scotsman to-day. Who can know and appreciate the conditions of the laboring man better than one who has been rocked in the cradle of poverty, and compelled by necessity to participate in the labors of those among whom he lives?

The doffer boys of to-day are far removed from the hard task which Andrew Carnegie had to perform in order to earn his $1.20 a week. Working conditions among the cotton mill people are far superior in every particular to what they were even ten years ago, and with the better conditions of labor, there has also come better wages, better houses, better schools, and a higher plane of living in general.

While working as a doffer boy Andrew Carnegie was subject to the usual "ups and downs" that are peculiar to this position, and which are only appreciated by those who have come in direct contact with the endless jobs that are generally attached to the position of doffer. Doffing is understood by those familiar with cotton mill vernacular as the taking off of the full bobbins and replacing them with empty ones. This term is applied to the various machines in the mills, and even in the picker room, and the card room we have the doffing of the laps and the doffing of cans, in each instance, it refers to the taking off of the finished product. The doffer boy, however, when referred to in general terms, is understood to be one whose duties are to remove the full bobbins of yarn from the spinning frame spindles and replace them with empty bobbins. This work being rather simple and requiring little or no experience, has always been done by small boys, and when a family "moves to the cotton mill" and asks for work for the whole family, it is to doffing that the boys are usually put. Such was the case in Andrew Carnegie's boyhood days and the same conditions prevail, largely to-day. Child labor, of which we hear so much to-

day, is a relic of the former system of the "home factory," where every member of the family was required to do such work as best suited their age and experience, and while labor conditions in general have been greatly improved during the past few years, that work done by the younger members of the family shows a much greater improvement than any other. The conditions of child labor in the cotton mills have been greatly exaggerated during the past few years. This has come about largely through those seeking notoriety, or who for political reasons have been perniciously active in behalf of the laboring classes. The Carnegie family on coming to this country found in the cotton mill a suitable place, wherein to make a living, as have thousands of other families, who by force of necessity, are compelled to work for a living. As a doffer boy Andrew was required to clean the machinery, sweep the floor, bring water, and to do a hundred and one other jobs that were tacked on to the duties of doffing. Whatever was required of him he did it the best he could. He was thorough-going in his work and soon won the good will and esteem of his employers. The flame of his ambition burned brightly and though required to work hard his motto, Nil desperandum (never despair) stood him in good stead and he performed, with credit to himself, every task that was assigned him. After a year or so as doffer boy he accepted a much harder position in the boiler room, where he was required to shovel coal into the furnace and to oil and look after the pumps and engine. This position, while being unusually severe on a boy of his age offered him increased pay and an opportunity to contribute more to the support of the family, of which he was justly proud. This work, however, soon began to tell on his not already strong constitution and he was forced to give up the place. He then left the mill and secured a position as telegraph messenger boy at a salary of $3.00 per week. Andrew Carnegie was not an example of the old proverb that "A rolling stone gathers no moss," for he changed his positions often. While he always attended diligently to whatever work he was set to do, he never lost an oppor-

tunity to get a better position. He was trained in the hard school of experience. He, like Napoleon, learned early in life, "the value of time." He was always busy and was a hard worker. As a messenger boy he took advantage of the spare moments around the office to learn to be an operator, he made a name for himself, and soon became known as one of the best on the system. He systematized his work in order that he could do more of it and find leisure time for self-improvement. He did not object to long hours of hard work for he had an ambition to rise in the world and was not content to remain in mediocrity. He knew that the poet spoke truly in these words:

"The heights by great men reached and kept,
Were not attained by sudden flights,
But they while their companion slept,
Were toiling upward in the night."

While an operator Andrew Carnegie was given an opportunity to earn a few extra dollars by doing copy work for some of the newspapers, and he looked upon this money as real capital. His father having died when Andrew was about 15 years of age, the support of his widowed mother devolved largely upon him, and it was to her that he always went for advice, at this time as well as in the long years afterward.

Having become an expert operator he attracted the attention of the railway officials who frequently had business with the office where Carnegie was stationed. He was offered and promptly accepted a position as telegraph operator in the service of the Pennsylvania Railroad. In this position, as in those he had formerly held, he "made good" and was rapidly advanced in salary and position until he was eventually made private secretary to Thomas A. Scott, then superintendent of the Pittsburg division of the Pennsylvania lines. Andrew Carnegie has never ceased to be a hard worker, and it is only by the recognition of this essential to success that anyone ever gets anywhere. There is a class that labors under the delusion that success is only for the few, and comes only by luck or inspiration.

Thomas A. Edison, however, has given us a good answer to the question: "Does success come by inspiration?" No, says Edison: "Success comes only by perspiration."

When the civil war came on Mr. Scott was made assistant secretary of war and Mr. Carnegie continued with him as private secretary, going to Washington with his chief. Mr. Carnegie was, at this time, 24 years of age and displayed considerable tact and judgment in the handling of the troops and the despatching of equipment and supplies for the army. He was present at several battles, but took no active part in the war except in his capacity as private secretary to Mr. Scott. In June, 1862, Mr. Carnegie returned with Mr. Scott to Pittsburg, and soon thereafter succeeded him as superintendent of the Pittsburg Division of the Pennsylvania road. Mr. Carnegie was greatly admired by Mr. Scott, whom he had served long and faithfully. Carnegie's first investment came about on the advice of Mr. Scott, who advised the former to buy ten shares of stock in the Adams Express Co.. This he was not able to do, however, until his mother—always ready to help her dear boy—mortgaged the home for the necessary $600. The investment proved good and the stock was sold, afterwards, at a handsome profit. After Mr. Carnegie became a superintendent, which was his last position as an employee, his successful ventures came fast and decisive. He became interested in a company to build sleeping cars, and from this enterprise made considerable money.

He made several profitable deals in oil wells about the time Rockefeller was monopolizing that great industry. Foreseeing the demand that was sure to come, at an early date, for steel bridges to replace the old wooden ones that were frequently being burned, thereby seriously delaying traffic, he resigned his position with the railroad and organized the Keystone Bridge Works. This concern became the basis of his marvelous operations for the next twenty or thirty years. He continued to build and equip steel works, and to manage them in such a masterful way that he became known throughout the entire world as the

Steel King. At the time of the organization of the United States Steel Corporation, Mr. Carnegie almost, if not entirely, dictated the price of steel to the whole world. He sold his steel works to the Giant Corporation for the staggering sum of $300,000,000, receiving $100,000,000 in cash and $200,000,000 in five per cent gold bonds. Since the passage of the Income Tax Law there has been a good deal of comment on the foresight displayed by Mr. Carnegie in making his deal with the Steel Trust. He had it stipulated in the contract that the bonds were to be exempt from all State and National tax.

Mr. Carnegie's fortune is estimated to-day at $300,000,000, notwithstanding the fact that he has given away many millions of dollars in establishing free libraries and other educational institutions. Under the Income Tax Law referred to he would have had to pay to the government a tax of six per cent on his income, which is estimated at $15,000,000 per year. This tax would have cost Mr. Carnegie $900,000 a year, but owing to the provision in his contract with the Steel Corporation, regarding State and National tax, it is said, he will be absolved from the payment of the income tax on these bonds.

To have come up from a poor doffer boy in a cotton mill, working for 20c a day, to be a great money king, with an income of more than $41,000 a day, and to be employed only in the effort to give away his money faster than it accumulates, is indeed a story worthy of careful thought. Mr. Carnegie was always thrifty and to this we must attribute much of his success.

We cannot, of course, all be millionaires, nor should we want to be. However, it should be the aim of every man to save at least a part of his salary, and he who does this, will get ahead financially, while the great majority will continue to be the tails of other men's kites. Plan your course so that you will not always be dependent on your salary. Build up a reserve fund. From time to time make wise investments, and in a few years you may become independent, and in the meantime, you will be able to do more work and better work, because your mind will be relieved of that anxiety, as to what would happen

should your regular income fail. There is food for thought in a saying of the late E. H. Harriman that "Only the poor are wasteful." Practically all riches are founded on someone having adopted the saving habit. We should learn early and practice assidiously, the habit of saving our money:

Not for to hide it in a hedge,
Nor for a train attendant,
But for the glorious privilege
Of being independent.

Son, next week we will take up some of the calculations, pertaining to spinning. This letter is long, but I trust you will find it both interesting and profitable.

Sincerely, DAD.

LETTER NO. 10.

MY Dear Son:—This thanks you for your very interesting letter, which has just reached me. I am glad to hear that you have been promoted to second hand, and, of course, you have my very best wishes for a grand success.

You have done well, and I am pleased at the rapid progress you are making.

In letter No. 6, I gave you a few rules on finding the number of yarn, now, we had better take up some more calculations. I have already explained to you the system of cotton yarn numbering now we will see by what means we may change from one number to another. This is accomplished by what we call "draft," and may be explained in several different ways.

The "draft" of a spinning frame may be said to be the difference between the surface speeds of the front and back rolls; or, it may be explained as the difference in the weight, or length, of the product going into the frame, or machine, and that coming out.

If the surface speed of the back roll was 40 inches per minute, and the surface speed of front roll 400 inches per minute, there would be a draft of ten, and each inch of roving taken in by the back roll would be drawn out, into ten inches, by the front roll.

To change this draft we increase or decrease the speed of the back roll, the front roll remaining at a constant speed. The back roll is driven from the front roll by gears, and there is usually a gear upon the front roll, one upon the back roll, and two connecting gears called, crown gear and draft gear respectively.

The draft gear is the one generally changed when it becomes necessary to make the yarn lighter or heavier, although this result could be obtained by changing any of

the gears, in the train, and it is the custom in a great many places to change the crown gear, instead of the draft gear.

There is an advantage in changing the crown gear, in that it usually contains a great many more teeth, than does the draft gear, and thus finer changes can be made, for instance: in changing a gear that contains 100 teeth the result is a change if one one-hundredth, whereas when changing a gear of 30 teeth the result is one-thirtieth. But, say, look-a-here who in the devil can write about drafts and twists and other such dry subjects, with a circus street parade going along just outside my window. Not me, I am going to quit right here and get out on the streets and follow the clowns and other animals back to the show grounds and right there I'll stay until the wee small hours of the morning, and I may drink some red lemonade if I can find any in "brown bottles." Good night!

Here's some tables that you may find need for, so clip them and paste them in your memorandum.

Measures of Length.

Inches	Feet	Yards	Rods	Furlongs	Miles
12	1				
36	3	1			
198	16 1-2	5 1-2	1		
7920	660	220	40	1	
63360	5280	1760	320	8	1

Measures of Area

Square Inches	Square Feet	Square Yards	Square Rods	Acres	Square Miles
144	1				
1296	9	1			
39204	272 1-4	30 1-4	1		
6272640	43560	4840	160	1	
4014489600	27878400	3097600	102400	640	1

Measures of Time.

Seconds	Minutes	Hours	Days	Weeks	Years
60	1				
3600	60	1			
86400	1440	24	1		
604800	10080	168	7	1	
31557600	525960	8766	365 1-4	52 5-28	1

Measures of Quantity.

Gills	Pints	Quarts	Gallons	Barrels	Hogsheads
4	1				
8	2	1			
32	8	4	1		
1008	252	126	31 1-2	1	
2016	504	252	63	2	1

Table of U. S. Money.

Mills	Cents	Dimes	Dollars	Eagles
10	1			
100	10	1		
1000	100	10	1	
10,000	1000	100	10	1

Mensuration.

A LINE is that which has **length** only.

A POINT is that which has **position** only.

An ANGLE is formed by two lines diverging from a **common point.**

A RIGHT ANGLE consists of a **horizontal** and a **perpendicular** line.

A TRIANGLE is a figure bounded by **three** straight lines.

A QUADRILATERAL is a plane figure having **four** straight sides.

A PARALLELOGRAM is a quadrilateral the **opposite** sides of which are **equal.**

A CUBE is a body having **six equal square** sides or faces.

A SURFACE or AREA has **length** and **breadth.**

A CYLINDER is a round body of **uniform** diameter whose ends are **parallel** to each other.

A PRIZM is a body whose ends or bases are **equal** plane figures and whose sides (3 or more) are **parallelograms.**

A CONE is a body having a **circular** base and tapers uniformly to a point called the **vertex.**

A FRUSTRUM of a cone or pyramid is the part that remains after cutting off the top parallel with the base.

A PYRAMID resembles a cone being many sided instead of round.

A SOLID or BODY has **length, breadth** and **thickness.**

A SQUARE is a quadrilateral whose sides are all **equal** and whose angles are all **right** angles..

I'm off for the circus. More later.

Sincerely DAD.

LETTER NO. 11.

MY Dear Son:—Now that the circus is over we must get down to business and make up for lost time. The tables which I gave you last week have very little to do with a spinning room, and yet you will find that you will frequently have need of them, so I thought I would just throw them in.

Now that you are a second hand you should begin to look into the many calculations that are required to be made in order to get the correct results for any number of yarn, and too you must make a more careful study of the labor problem. If you have followed my letters, carefully, and I believe you have, you should be pretty well posted on how to get along with your help, with the least amount of trouble, and as I have already pointed out, this is by no means, a small item. When I began to learn about spinning one of the first rules I got fixed in my mind was a simple one on draft, it ran in this way; if you are making a number 14s yarn with a draft of seven what is your hank roving? I was told that by dividing the number of yarn by the draft it would give the hank roving. Following out this rule we find that 14 divided by seven equals two, the number of the roving. Now you will find that the figuring of draft is simply a question of multiplication, subtraction and division, as you will see from the following: a draft of seven, with a two hank roving, produces a number 14s yarn. Dividing the number of yarn by the draft, gives the hank roving; dividing the number of yarn by the hank roving gives the draft, and multiplying the draft by the hank roving, or the hank roving by the draft gives the number of yarn. This is the foundation of all draft calculations, and while it is practically correct it should be remembered that there is a varying amount of contraction which makes the yarn slight-

ly heavier than what the figures will show. This contraction will vary from three per cent to probably ten per cent, but it is fairly safe to allow five per cent. To find what per cent the yarn actually contracts, you should divide the number that the yarn actually sizes, by the number obtained by figures, thus: if you figure for number 14s and the yarn sizes 13.30 what is the contraction? By dividing 13.30 by 14 we get .95 subtract this from 1.00 and we have 5, for the per cent of contraction. You will bear in mind that in the numbering of the roving the same rules apply as in the numbering of yarn, and when we speak of a two hank roving we mean that two hanks of that roving will weigh one pound just the same as if it was yarn, in fact the only difference in yarn and roving is the difference in the twist, ordinary warp yarn having twist equal to 4.75 times the square root of the number, while roving, ordinarily, has only 1.20 times the square root of the number. Now to figure out the draft of a spinning frame by the gears we will suppose the following for an example: Front roll gear 30 teeth, draft change gear, 24 teeth, diameter of front roll 1" or 8-8". Crown gear 84 teeth, back roll gear 84 teeth, diameter of back roll 7-8". Then to get the draft we multiply the front roll gear, the draft gear and the diameter of back roll together for a divisor; the crown gear, back roll gear and the diameter of the front roll together for a dividend, as follows: $30\times24\times7=5{,}040$. divisor. $84\times84\times8=56{,}448$, dividend. $56{,}448\div5{,}040=11.20$, Draft. To get the constant number we work in the same way, except that we leave out the draft gear. To find the constant number on a frame geared as above we will work as follows: $30\times7=210$, divisor. $84\times84\times8=56{,}448$ dividend. Then $56{,}448\div210=268.80$ constant number.

To get the draft from the constant number it is only necessary to divide the constant number by the draft gear thus: $268.80\div24=11.20$ draft as before, or to find what draft gear is required to give a certain draft, it is only necessary to divide the constant number by the draft thus: $268.80\div11.20=24$ the draft gear required. Now my boy if you will get this matter firmly set in your mind you should

be able to figure out any case of draft that may be required of you, also you should bear in mind that when you are using double roving you should first reduce it to single, that is; two strands of a four hank roving would be considered the same as one strand of two hank roving, you will of course, understand why this is so. Now I will have to leave you until next week, and I suggest that you study this lesson very carefully. Next week I hope to be able to get deeper into these calculations. With all good wishes I am. Sincerely yours, DAD.

LETTER NO. 12.

MY Dear Son:—In regard to the draft of a spinning frame there are a great many ways to get it. As I pointed out last week the usual method is through the gears, but here is another way:

Rule:—Divide the surface speed of the front roll by the surface speed of the back roll, the result will be the draft. Example: Suppose the surface speed of the front roll to be 1200 inches per minute, and the surface speed of back roll to be 200 inches per minute then $1200 \div 200 = 6$ the draft of the frame. Now you will want to know of course how to get the surface speed of the rolls and I will give you the rule.

Rule:—Multiply the diameter of the roll by 3.1416 and this product by the revolution per minute, of the roll. Example: What is the surface speed of a one-inch roll, which makes 127.33 revolutions per minute. Applying the rule given: $1 \times 3.1416 \times 127.33 = 400$ inches per minute.

To Find the Number of Bands Per Pound.

Rule:—Divide 7,000 by the weight of one band in grains.

Example:—One band weighs 58.33 grains, then $7{,}000 \div 58.33 = 120$ bands per pound.

Rule:—Divide the number of inches of yarn delivered by the front roll per minute, by the circumference of the bobbin, and subtract this result from the speed of the spindle, the result will be the speed of the traveler.

Example:—Inches of yarn delivered per minute by the front roll, is 400. Speed of spindle 8,000. Diameter

of bobbin 1 inch. Then 400÷3.1416=127.32 8000—127.32= 7872.68 the speed of the traveler. It will be seen from this that the speed of the traveler must necessarily vary with the circumference of the bobbin, and is always just enough behind the spindle to wind on the amount of yarn that is being delivered by the front roll. If the spindle and traveler made the same number of revolutions it is evident that there would be no winding-on.

To Find the Twist in Yarn from the Speed of Spindle and

Rule:—Divide the speed of spindle, by the surface speed of front roll, the result is the twist per inch.

Example: Speed of spindle 8,000, surface speed of front roll 400 inches per minute. Then 8000÷400=20 the turns per inch. This result is practically correct but the twist will be slightly in excess of that shown, on account of the contraction.

The basis upon which all twist, for yarn and roving, is figured, is the square root of the number, not that this has anything in particular to do with it, but because it furnishes a regular scale. The following table gives the standards that have been generally adopted for different kinds of cotton yarns:

Extra warp twist 5.00 times the square root of the number.

Ordinary warp twist 4.75 times the square root of the number.

Low warp twist 4.50 times the square root of the number.

Extra mule warp twist 4.00 times the square root of the number.

Mule warp twist 3.75 times the square root of the number.

Extra Filling twist 3.50 times the square root of the number.

Filling twist 3.25 times the square root of the number.

Hosiery twist 3.00 times the square root of the number.

It will be found that these figures are not accepted by all mill men as being correct, and that there is a wide difference of opinion as to the exact amount of twist that

should be put in the different kinds of yarn. However this will be found to furnish a good guide, in connection with which one must use their own good judgment and experience.

To Find the Twist Multiple Being Used.

When it is not known just what multiple was used in adjusting the twist, we can determine this by the following: Rule:—Divide the turns per inch being put in by the square root of the number of the yarn being spun. Example: Spinning number 16s with 19 turns per inch, what is the twist multiple being used? The square root of 16= 4 then 19÷4=4.75, the answer.

It is well to keep in mind that the contraction varies with the twist, there being more contraction in warp yarn than in filling yarn. As a general proposition, the more twist you put in the more contraction you will have, and the more contraction you have, the more twist there will be.

To Find the Twist of a Spinning Frame by Gears.

Rule:—Multiply the cylinder gear, twist change gear, and circumference of front roll, together for a divisor. Multiply the jack gear, front roll gear, and ratio of cylinder to whirl, together for a dividend, the result will be the twist per inch.

Example: Suppose we have a frame geared as follows: Cylinder gear 50 teeth, Twist gear 16 teeth, circumference of one inch front roll 3,1416". Jack gear 60 teeth, front roll gear 112 teeth, ratio of 7" cylinder to 3-4" whirl 8.24. Then work as follows: 50×16×3.1416=2513.28 divisor. 60×112×8.24=55,372.80 dividend. Then 55,372.80 ÷2513.28=22.03 turns per inch of twist.

To Find the Twist Constant.

Rule:—Work the same as for twist except that you leave out the twist change gear. Following the example given above we have: 50×3.1416=157.08 for a divisor. 60×112×8.24=55,372.80 for a dividend, then, 55,372.80÷ 157.08=352.51 constant number.

The same rule will apply here as was explained in regard to constant number for draft, the constant number

divided by the twist gear will give the twist per inch, and the constant number divided by the twist per inch will give the twist gear required, as follows: 352.51÷16 =22.03 twist per inch. 352.51÷22.03=16 twist change gear.

To Find Speed of Cylinder.

Rule:—Multiply speed of counter shaft by diameter of pulley on same and divide this product by the diameter of pulley on cylinder. Example: Speed of counter shaft 330 revolutions per minute, diameter of pulley on same 30 inches, diameter of pulley on cylinder 10 inches, then 330× 30=9900÷10=990 revolutions per minute.

To Find Speed of Spindle from Speed of Cylinder.

Rule:—Multiply speed of cylinder by diameter of same and divide this product by diameter of whirl on spindle. Example: Speed of cylinder 990 revolutions per minute, diameter of same 7 inches, diameter of whirl on spindle 3-4 inches, then 990 ×7÷3-4"=9240 revolutions per minute. It is customary to allow a certain percentage for the slipping of the band, some do this by adding 1-16" or 1-8" to the diameter of the whirl.

General Speed Calculations.

Practically all speed calculations may be made by observing the following four terms: First, speed of driver; Second, diameter of driver; Third, diameter of driven; Fourth speed of driven. The following rules will apply:

Multiply first by second and divide by third gives fourth.

Multiply first by second and divide by fourth gives third.

Multiply fourth by third and divide by second gives first.

Multiply fourth by third and divide by first gives second.

Now, Son, I have given you these rules just as they have occurred to me and in a very simple way, in order that you would have no trouble in readily understanding them, of course I could have stated some of these matters in a more technical way, and have avoided a great deal of repetition but my object has been to make them so plain

that anybody with a thimble full of brains could readily understand just how to do any of the things I have referred to. Your advancement has been rapid, you have done fine, or as "Teddy" would say you are doing "bully." I trust you are doing as well morally as you are industrially, and that you will not get to be one of these fellows we hear so much about that turn out to be such a character, as is referred to in "he's a devil in his own home town." You are learning a good trade and I believe that we are going to see a great revival in the textile industry in the next few years, and good men are going to be in demand, as never before. Stick to your job and when I can serve you, don't hesitate to call on me.

Very sincerely yours, DAD.

LETTER NO. 13.

MY Dear Son:—Now that you have been promoted to boss spinner, I feel that you should be able to get along nicely, in view of the fact that you have had considerable drilling from your very first entrance into the mill. I have endeavored to give you such instruction as, in my opinion you would most need and while these letters have no doubt been of service to you I am aware of the fact that you possessed the needed qualities that go to make a mill man, otherwise, you could not have gone up as rapidly as you have.

No man can advance in any line of work unless he has ability to command the respect and confidence of his employer, as well as the good will of those who work with and under him. The man who cannot command the good will of both employer and employee, will find very little encouragement in any line of industry, especially is this true in a position where one is required to direct the work of others and carry the responsibility for large numbers of less-informed workers.

You will find that your duties as a boss spinner will keep you fully engaged; you will have little time to devote to outside interests and I would advise you to keep free from such "outside interests." Few men ever become an expert at more than one thing, and you will do well to concentrate all your efforts towards becoming the best boss spinner in the country. Remember the saying attributed to Emerson that: "If a man can write a better book, preach a better sermon, or make a better mouse trap than his neighbor, even though he live in the forest, the world will make a beaten track to his door." My son if you can make of yourself the "best boss spinner in the country" you will never need to hunt a job, your services will always be in demand. Further than this a man who can run

a spinning room better than anyone else, can set his own price. The great trouble with most men who enter the cotton mill business, is that they do not try to master the details of the business. As soon as one learns enough to merely hold a job of small proportions, they stop studying and soon get into a rut where they remain, grinding away, as lifeless as a mere machine. Strive to realize the ideal in the saying quoted above, and in the realization, at each step gained, you file the chain which binds Success.

It is not so much what a man knows, as what he does; one may know all about running a spinning room; may know how to make any calculation that is ever required, and yet be a complete failure as a boss spinner. If you are not willing to work hard; to assume a great deal of responsibility, and to virtually do the thinking for many of those placed under your care you had just as well quit right now, and go out on a farm where you can get a job plowing a steer. You are doomed to failure, if you enter the cotton mill thinking that it does not require the use of ones brains. There will come a time when you will feel like you have the hardest job on earth, that everybody else is having a good time while you are up to your neck in trouble, but don't get discouraged, keep a stiff upper lip and fight it out. Don't be a quitter. Nothing worth while was ever attained by those who balk at every little hill of difficulty. Obstacles are put in our way to be overcome and not to stop our progress and each obstacle overcome gives us greater confidence in our ability and helps us on to greater accomplishments. Remember that opportunity comes to every one, whether they are ready for it or not, some say that opportunity makes the man, others that man makes the opportunity, it matters little to us how we look at this proposition, as long as we are not prepared to take advantage of the opportunity when it does come. It is said of Napoleon that "he made himself ready for a great opportunity and a great opportunity came to him."

Perhaps you will at times feel like throwing down the job and walking out, you will get blue, become dissatisfied, with everybody and everything, but wait-a-minute,

right-about face and look at the proposition squarely. Don't lose your head, remember to:

Let nothing disturb thee,
Nothing affright thee;
All things are passing,
God never changeth,
Patient endurance,
Attaineth to all things.

In this series of letters I have not attempted to give a great many calculations, these may all be had from the machinery catalogs, and really as I see it they are not by any means the most important part of what a spinner needs to know. At some future time I expect to add something to what I have had to say to you along this line.

I am now to close this series of letters and in doing so I sincerely hope that they have not been altogether uninteresting, and that you who have read them will find helpful suggestions herein.

Many men have failed in the cotton mill business as a result of conditions over which they had no control, failure, however, is often due to one's own lack of practical knowledge. There are many ways in which we may learn. It has been said: "We may learn from experience, from books and from men," and doubtless, it requires all three of these to produce a well rounded evenly balanced, man of affairs. Experience is a great teacher, perhaps the greatest teacher, and yet a careful study of the experience of others should enable us to avoid the many pitfalls into which they have fallen only to rise and know that a "burned child fears the fire." Of the making of books there is no end and the fact that books are made in great and increasing numbers indicate that there is a demand for them, to supply which many men have given much time and careful thought to the preparation. A great deal may be learned from men, both good and bad, and one cannot be too careful in the selection of associates, from which they will acquire unconsciously perhaps habits and knowledge.

I am conscious of the fact that these letters are not by

any means as full and complete as they might have been and yet there is much practical information on the subject of spinning. No effort has been made to produce what is termed as "fine writing" or to turn out strictly technical matter. It is the sincere wish of the writer that all who may read the foregoing letters will find them not altogether uninteresting, and, if they shall be the means of helping some one to a better knowledge of the spinning department, and help some deserving man to a better position, the writer will feel that he has been graciously repaid for all the time he has spent in the preparation of this work.

With all good wishes for your success I am

Sincerely yours,

"DAD."

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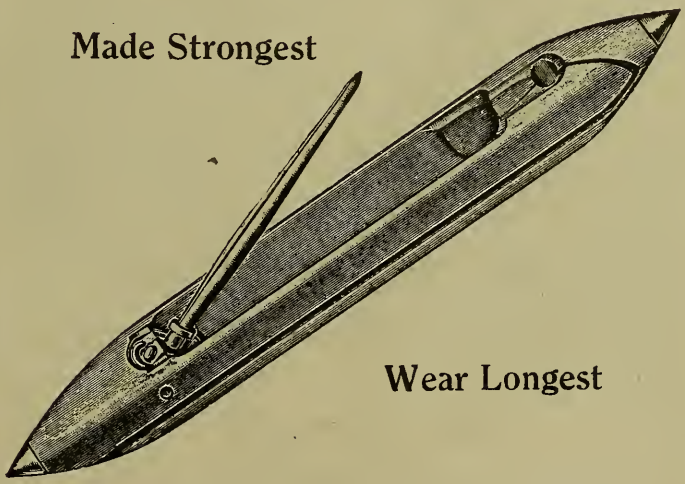

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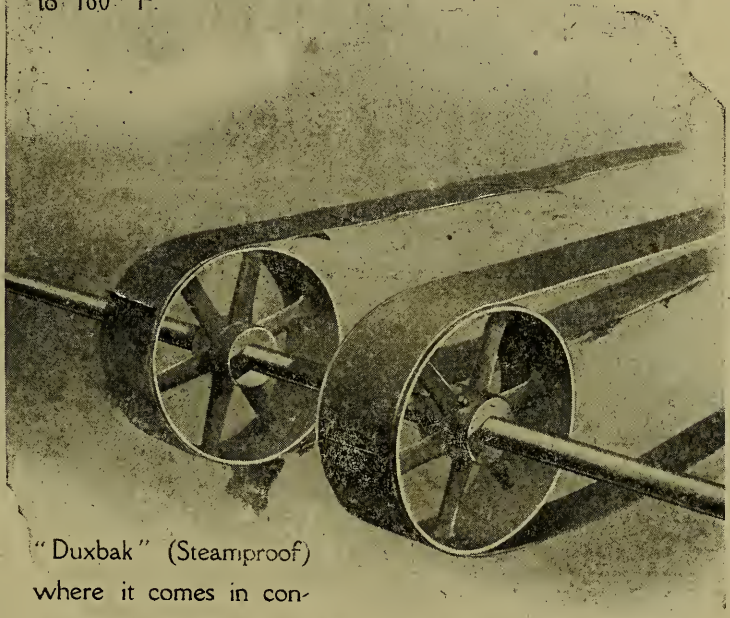

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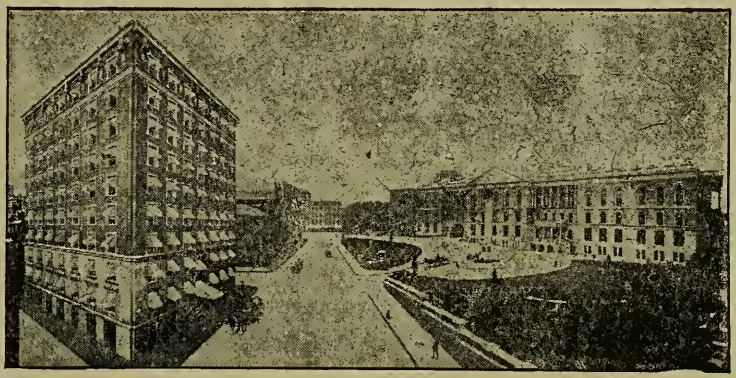

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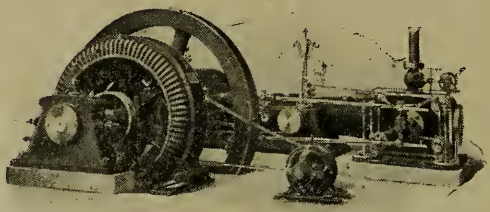

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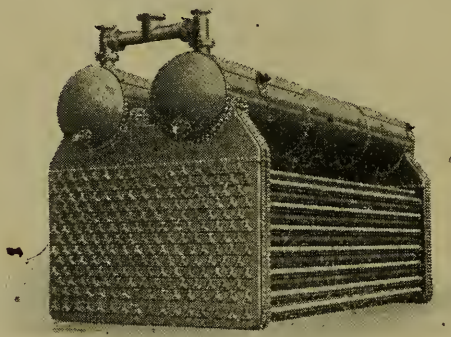

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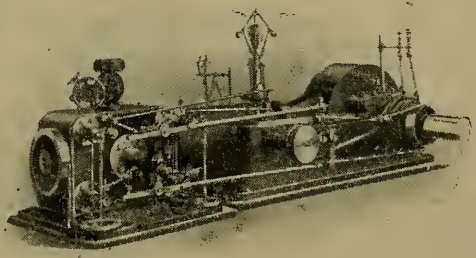

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(SPECIFICATIONS)

THIS invention has reference to improvements in carding machines, and its object is to effect a saving in cotton, as well as improve the quality thereof.

It is the customary practice in carding machines to run the carding cylinder and the flats in the same direction where they engage, wherefore the flats become progressively more contaminated with refuse taken from the cotton as the cotton approaches the doffer.

In accordance with the present invention the flats are caused to travel with the run adjacent to the cylinder moving in a direction the reverse of that of the card cylinder, so that the cotton is acted upon during its progress through the carding machine by successively cleaner portions of the flats and consequently when finally delivered to the doffer the cotton is markedly better and freer from refuse than has heretofore been the case.

Moreover, the invention includes an additional roller covered with carding cloth and located between the licker-in and the corresponding end of the web of flats, the arrangement of this roller being such as to be active to the flats and to the carding cylinder. The added roller is for the purpose of removing the cotton strips from the flats as they leave the carding cylinder close to the licker-in and after these cotton strips are cleaned the cotton is replaced upon the card cylinder. The result is that there is a saving of from seven to ten per cent, more or less, of the cotton and practice has shown that the resultant carding is superior to that obtained in a carding machine without the presence of the additional roller.

The refuse removed from the cotton in a day's run is almost free from cotton instead of this refuse containing

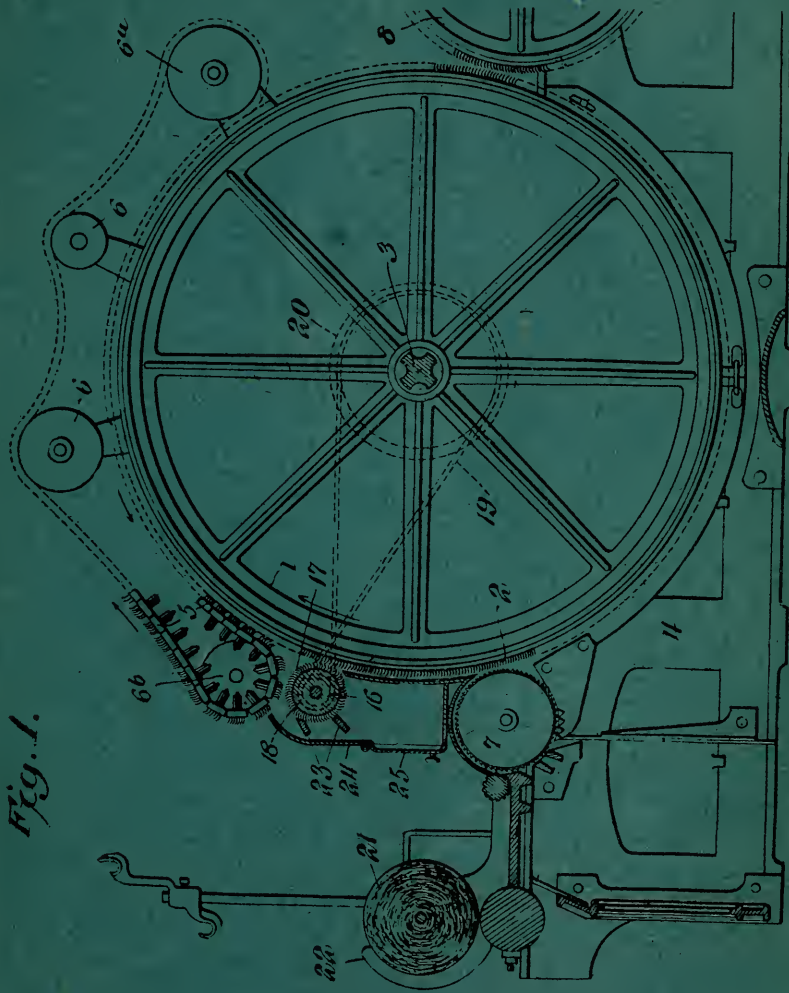
Fig. 1.
A. W. Greer, Sr.,
and J. A. Greer,
INVENTORS,
WITNESSES
Howard R. Cox
F. T. Chapman
BY
E. G. Siggers.
J. B. Siggers
ATTORNEYS

a material portion of the cotton treated by the carding machine.

The invention will be best understood from a consideration of the following detailed description, taken in connection with the accompanying drawings forming a part of this specification, with the further understanding that while the drawings show a practical form of the invention, the latter is not confined to any strict conformity with the showing of the drawings, but may be changed and modified so long as such changes and modifications mark no material departure from the salient features of the invention.

In the drawings:—

Figure 1 is a front to rear vertical section of a portion of a carding machine embodying the present invention.

Figure 2 is a perspective view of a portion of a carding machine embodying the present invention.

Figure 3 is an elevation of a portion of the opposite side of the machine from that shown in Figure 2, and showing driving mechanism for the flats.

Figure 4 is a longitudinal diametric section of the additional roller.

Figure 5 is a fragmentary view of a carding machine showing a somewhat modified construction.

Figure 6 is an elevation of a detail of Figure 5.

While the present invention is not limited to any special type of carding machine, it can be and has been used in connection with a carding machine such as illustrated in patent No. 623,094, granted to C. Mills and L. W. Penney, April 11, 1899, and a reference to said patent will be sufficient to disclose parts of the carding machine or engine which have not been illustrated in the annexed drawings because deemed unnecessary for the understanding of the present invention.

The carding machine or engine includes a carding cylinder 1 covered with the usual wire or carding clothing 2, and this cylinder is mounted upon a shaft 3 supported in suitable bearings in a frame 4 and driven in any appropriate manner.

Crowning the cylinder 1 is an endless chain of wire clothed flats 5 carried by rollers 6, and this web of flats

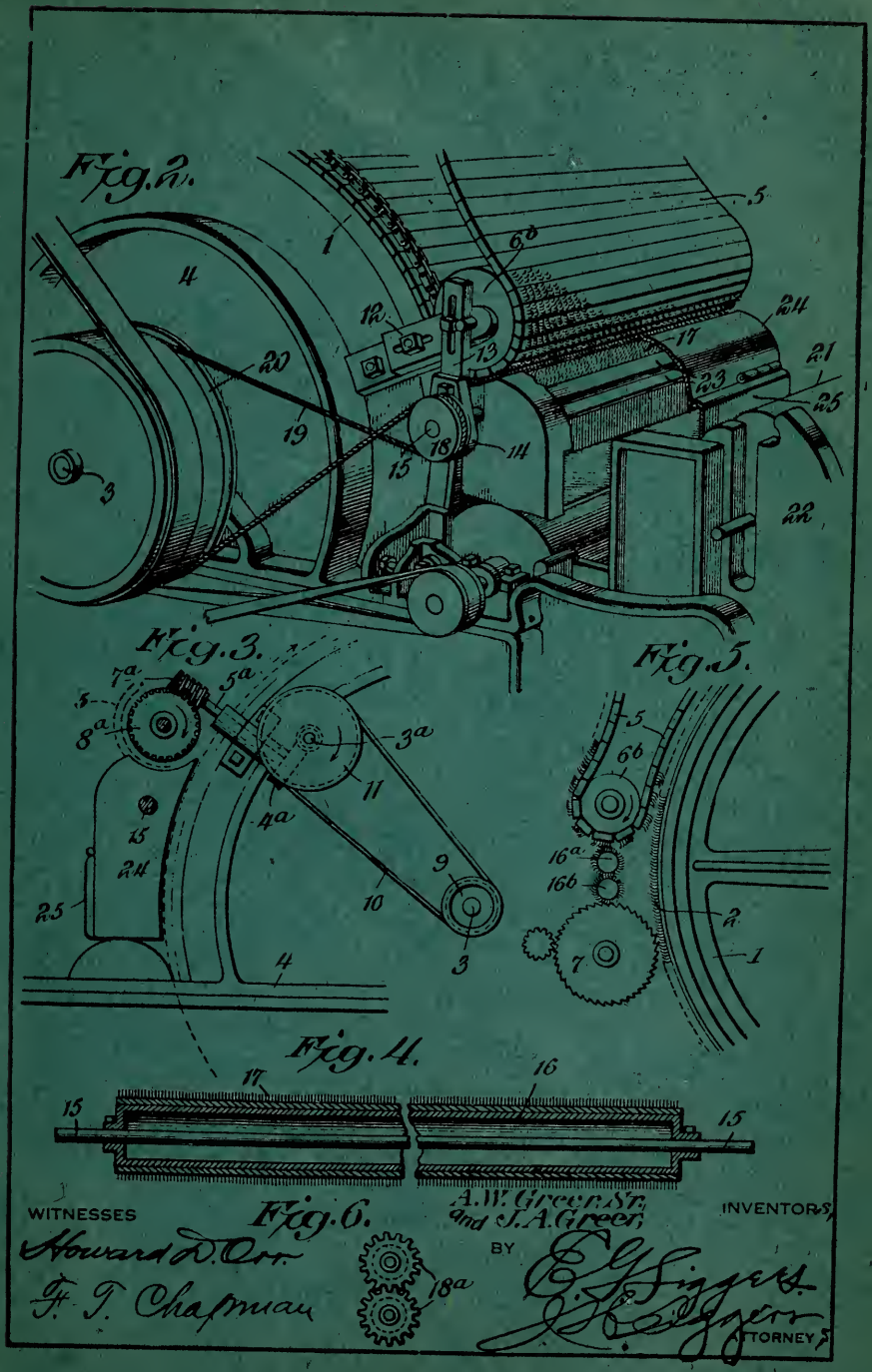
Fig. 2.
Fig. 3.
Fig. 5.
Fig. 4.
Fig. 6.
WITNESSES
Howard D. Orr
F. T. Chapman
A. W. Greer Sr. and J. A. Green
INVENTORS
BY
ATTORNEY

extends from a point near the licker-in 7 to a point near the doffer 8 all similar to the arrangement shown in the aforesaid letters patent.

There is, however, a material difference between the arrangement shown in the said letters patent and a carding machine or engine constructed in accordance with the present invention, and one of these points of difference relates to the course of travel of the flats.

It is customary with a machine such as shown in the said letters patent to drive the flats by power imparted to the end roller of the series of rollers supporting the flats and indicated in Figure 1 at 6a, the direction of travel of the run of the belt or web of flats next to the carding cylinder being in the same direction as the carding cylinder, and in the structure as viewed in Figure 1 where the direction of travel of the cylinder 1 is clockwise the direction of travel of the run of the flats next to the cylinder would also be clockwise, but in accordance with the present invention motion is imparted to the flats by power applied to the other end roller 6b of the series, so that the active run of the flats is counterclockwise as viewed in Figure 1, or the reverse of the direction of travel of the peripheral portion of the cylinder 1. It is customary to run the flats by a belt driven by a pulley 9 mounted on the shaft 3, and in a machine constructed in accordance with the present invention this pulley drives a belt 10 leading to another pulley 11 on a stub shaft 3a driving a worm gear 4a on another shaft 5a carrying a worm 7a in engagement with a worm gear 8a fast to the shaft or journal of the roller 6b and so arranged that the surface of the carding cylinder and the adjacent run of the flats move in opposite directions and, furthermore, the parts are so related that the movements are at such relative speeds as practice demands.

The roller 6b has journal bearings in brackets 12 carried by a suitable portion of the frame, and these brackets have other brackets 13 secured thereto and so located that they carry journal bearings 14 for the journal ends 15 of a roller 16, which latter is covered with card clothing 17 and is situated between that portion of the flats passing about the roller 6b and the licker-in 7, the card clothing of

the roller 16 being so related to the card clothing of the cylinder 1 and flats 5 as to nearly touch that of the flats on one side and the cylinder on the other.

The roller 16 is provided with a pulley 18 which may be mounted on one of the journals 15, and this pulley is driven by a belt 19 coming from an appropriate pulley 20 on the shaft 3, the parts being proportioned to impart to the roller 16 an appropriate speed of rotation which may be relatively high with respect to the speed of rotation of the cylinder 1 and the linear speed of the web of flats 5. The roller 16 is so connected up to the shaft 3 that its direction of movement where adjacent to the cylinder 1 and where adjacent to the flats 5 is the same as the corresponding surfaces of the cylinder and flats, although the roller itself rotates upon its axis in a counterclockwise direction in the view of the structure as seen in Figure 1.

The lap indicated at 21 is fed from the lap stand 22 to the licker-in 7 in the usual manner and to the cylinder 1 where it is acted upon by the flats 5 first by the loaded end of the web of flats and later by the cleaner portion of the web of flats until as the sliver approaches the doffer 8 it is subjected to the action of the cleanest portion of the flats, wherefore when the sliver approaches the doffer it is in far better condition than is the case where the flats and the cylinder 1 have their adjacent portion moving in the same direction.

The loaded top flats leave the cylinder 1 close to the licker-in and are there acted upon by the roller 16 which removes the strippings from the flats and replaces them upon the cylinder 1, which at this point has a greater peripheral speed than the roller 16, thus keeping the latter clean. Between the point where the roller 16 takes off the strippings from the flats and the point where it replaces these stripping upon the cylinder 1 a suitable number of mote knives 23 are located to knock out the motes, dirt and other trash, which trash falls into a mote box 24 enclosing the roller 16. The mote box has a door 25 for the convenient removal of collected trash at suitable intervals. By this means almost the entire amount of cotton fiber heretofore allowed to waste is replaced upon the

carding cylinder to be ultimately removed therefrom by the doffer 8, and practice has demonstrated that the resultant sliver is particularly clean, while the output of the machine is increased from seven to ten per cent, more or less, due to the saving of the strippings which are taken directly from the flats and at once replaced upon the carding cylinder, while in the interim between the removal of the strippings from the flats and the replacing of them upon the carding cylinder all motes, dirt and trash found in the strippings are removed.

The operation is wholly automatic and requires but the presence of one small additional roller which places no appreciable load upon the machine and requires no attention. The cost therefor of recovering the strippings from the flats is wholly negligible, and this recovery represents a material saving amounting to ten to thirteen pounds of cotton, more or less, per card, per day of ten hours, while the resultant carding is noticeably improved.

In the arrangement shown in Figure 1 the cotton strippings are taken from the flats and replaced directly upon the carding cylinder. Instead of such an arrangement the arrangement shown in Figure 5 may be employed where there is indicated a roller 16a and another roller 16b between the delivery end of the web of flats and the licker-in 7. These two rollers 16a and 16b are connected as by gearing 18a to rotate in opposite directions, the roller 16a rotating with respect to the flats in the same direction as the roller 16, while the roller 16b rotates in the opposite direction. Neither roller 16a nor 16b delivers upon the cylinder 1 in the structure shown in Figure 4, but the roller 16a strips the flats 5 and delivers upon the roller 16b which in turn delivers upon the licker-in 7 and the strippings are by the licker-in delivered to the cylinder 1, the motes and dirt and trash being removed from the strippings before they reach the cylinder 1.

In either structure shown in the drawings the flats travel in the opposite direction to the travel of the cylinder 1 so as to deliver close to the receiving portion of the cylinder, while the roller 16, or the pair of rollers 16a, 16b strip the flats of adhering cotton and restore this cotton

to the cylinder 1, the trash accompanying the strippings being removed before such strippings again reach the cylinder 1.

In the actual operation of the machine the waste is made up almost exclusively of motes and dirt and trash with hardly any noticeable quantity of cotton fiber, while the waste of a carding machine lacking the features of the present invention represents a very material amount of the cotton fiber which has heretofore been saved only at a material cost.

Claims Allowed.

1. In a carding machine or engine, a rotatable carding cylinder, a web of flats in superposed relation to the cylinder, means for driving the active run of the flats in a direction opposite to the movement of the corresponding portion of the cylinder, and a stripping roller for removing strippings from the delivery end of the web of flats and related to the cylinder to return the strippings thereto at the receiving end of the cylinder, said stripping roller being provided with means for removing the trash from the strippings on the stripping roller before the strippings are returned to the cylinder.

2. In a carding machine or engine, a rotatable carding cylinder, a web or flats in superposed relation to the cylinder, means for driving the active run of the flats in a direction opposite to the movement of the corresponding portion of the cylinder, and a stripping roller for removing strippings from the delivery end of the web of flats and related to the cylinder to return the strippings thereto at the receiving end of the cylinder, said stripping roller being provided with means for removing the trash from the strippings on the stripping roller before the strippings are returned to the cylinder, the trash removing means comprising mote knives and a mote box enclosing the mote knives and provided with a receptacle for trash and also provided with a door for access to the interior of the box.

3. In a carding machine or engine, the combination with a rotatable carding cylinder, a licker-in, a web of flats in superposed relation to the cylinder and means for driving the active run of the flats in a direction opposite to the

movement of the corresponding portion of the cylinder, of stripping means at and for removing strippings from the delivery end of the web of flats and constructed and arranged to cause the strippings to be replaced upon the cylinder to be again fed to the flats along with fresh or untreated material, said stripping means having means associated therewith for removing trash from the strippings before the latter again reach the cylinder.

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What the Greer Cotton Saver Does

In the first pages of this colored insert there are drawings and specifications of a new invention, which, for lack of a better name, has been called The Greer Cotton Saver.

The name given this new device is really a misnomer, as the chief object of the device is to improve the quality and increase the production of the card. That it does effect a material saving in cotton is incidental to its main purpose.

It has long been known that if the flats on a revolving flat card were run with their operating portion moving along the cylinder from the doffer towards the licker-in, that the product of the card would be greatly improved.

With the flats commencing their work at the back of the card and moving towards the front, to be cleaned, it is evident that all the trash and foreign matter which collects on the flats is brought forward, along with the cotton, and that a considerable portion of this trash must necessarily be delivered to the doffer and become a part of the finished sliver.

With the flats commencing their work at the front of the card and moving towards the back, clean flats are presented to the carding cylinder, at a point where the final carding is being done. This is as it should be, and any person, at all familiar with the principle and construction of a revolving flat card will be able to see, at once, that the product must be greatly improved by running the flats from front to back, instead of from back to front, as is now the custom.

When the flats are run from front to back a decided improvement is also made in the quality of the work, due to the fact that the flats are leaving the card at the back —where the cotton enters—and a great quantity of heavy trash is removed immediately and never finds its way to the front of the card, whereas, in the present system all the trash entering the card must remain in contact with the cylinder and flats until it reaches the front of the card, where it either passes into the finished sliver or is removed with the strips.

Realizing that a great improvement would result from such a change, many attempts have been made, heretofore, to run flats from front to back, none of these efforts have,

however, been sufficiently successful to warrant their adoption. The chief obstacle to be overcome in running the flats from front to back was the stripping of them. This could not be successfully accomplished by a comb, owing to the wire pointing in the direction of movement.

In the present invention the flats are stripped automatically, and the strips, after being cleaned, are returned to the card, to be again treated in the regular manner.

It is well known that card strips contain a considerable percentage of good fibres, to recover which it is the usual custom to return the card strips to the mixing room to be reworked. Their reworking is detrimental to the fibre, and is also an added expense.

The production of a card being limited to the amount of cotton that can be carded and cleaned it is evident that increasing the carding and cleaning capacity of the card, automatically increases its producing capacity, and this is what the present invention accomplishes.

The running of the flats from front to back; the adding of two small stripping rolls between the flats and licker-in; the removing of the strips from the flats; the cleaning of the strips and the replacing of them upon the cylinder, is all accomplished by this device, automatically, with a minimum of mechanism and with no appreciable increase of load on the machine.

The general adoption of this improvement will doubtless take place, as rapidly as possible, wherever its salient features become known. Such general adoption will mark a decided improvement in carding and will mean a better product; an increased production, less waste and reduced cost.

This invention is fully protected by Letters Patent.

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